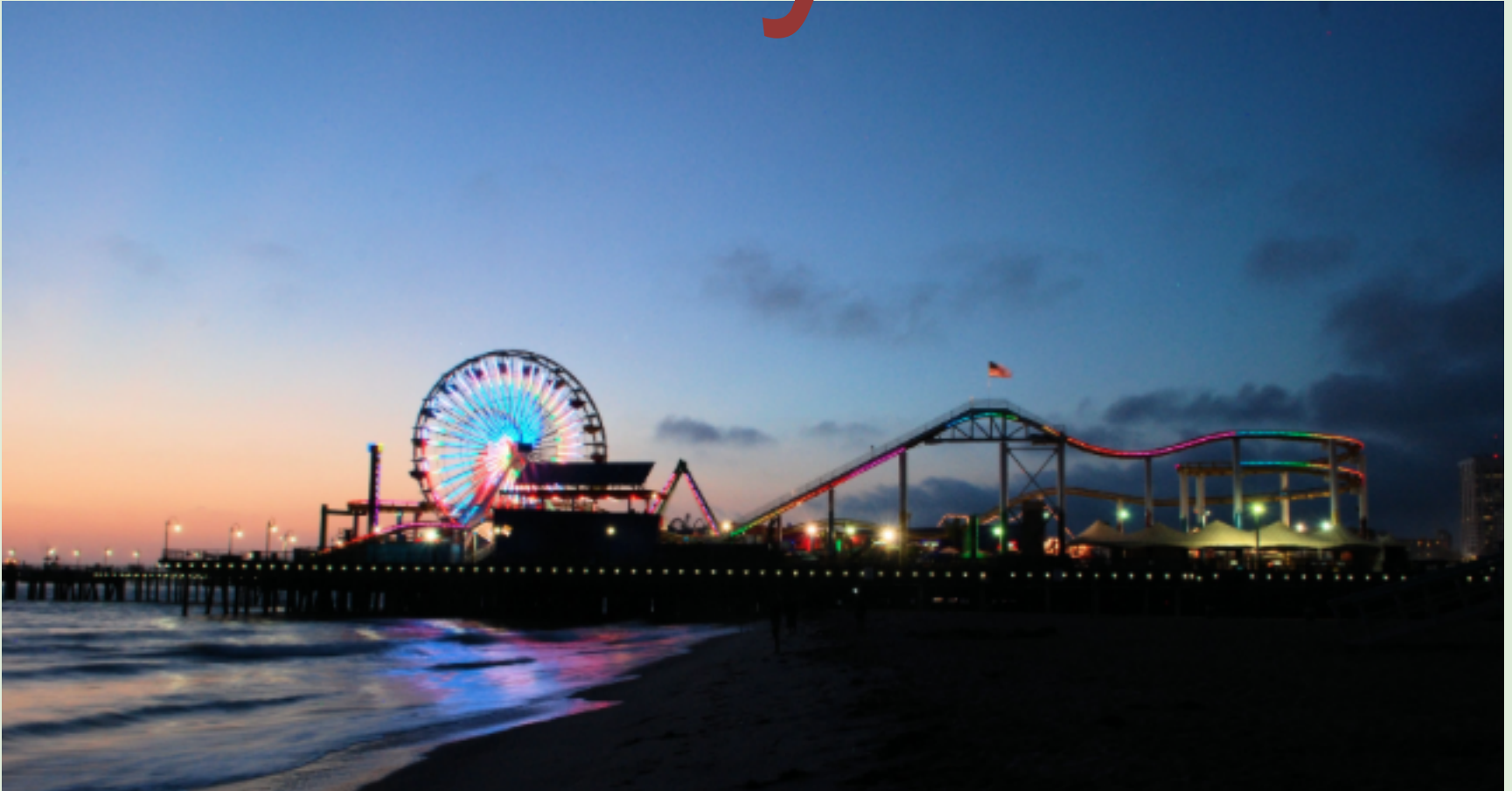


Day 3



What is your favorite ride?

Brain Break!



Where We Have

Been

- Identify the state research problem in a study.
- State the research question related to the research problem and identify the variables.
- Recognize the operationally defined terms utilized in the research problem and study.
- Identify the relevant conclusions of the review of the literature.
- Describe the sampling techniques and research instruments utilized in research studies.
- Identify the research design.
- Critically analyze the potential strengths, as well as potential threats to the external and internal validity of the research investigation.

Where We Are Going

- Identify the state research problem in a study.
- State the research question related to the research problem and **identify the variables**.
- Recognize the **operationally defined terms** utilized in the research problem and study.
- Identify the relevant conclusions of the review of the literature.
- Describe the sampling techniques and **research instruments** utilized in research studies.
- Identify the research design.
- Critically analyze the **potential strengths**, as well as **potential threats** to the external and internal validity of the research investigation.

Ways to create random samples:

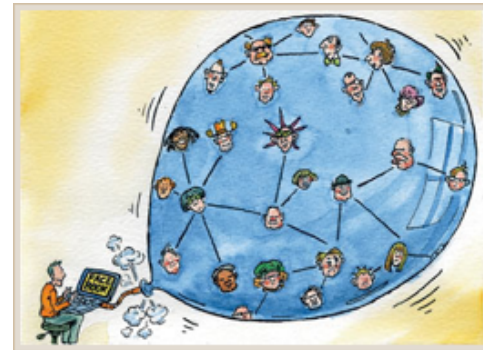
Simple Random
Cluster Random
Systematic Random



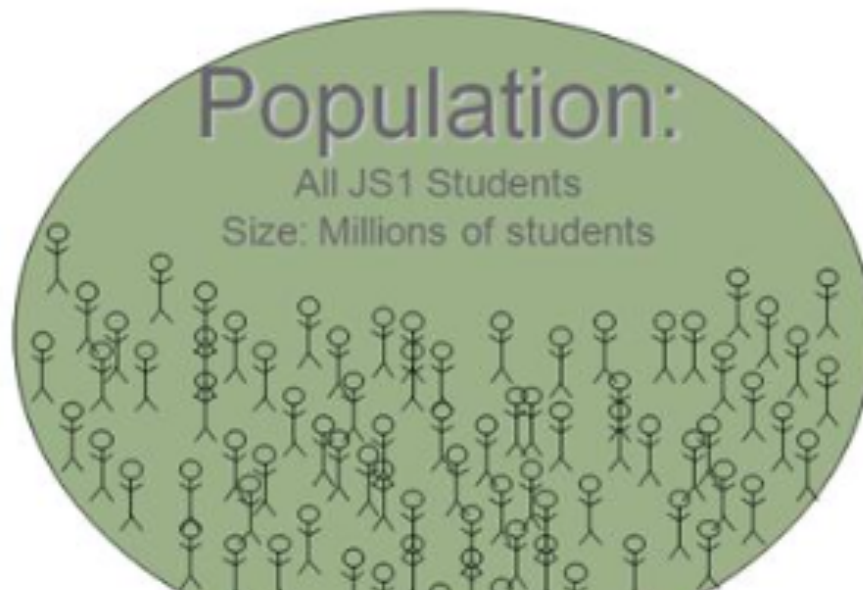
Stratified Random

Way to create non-random samples:

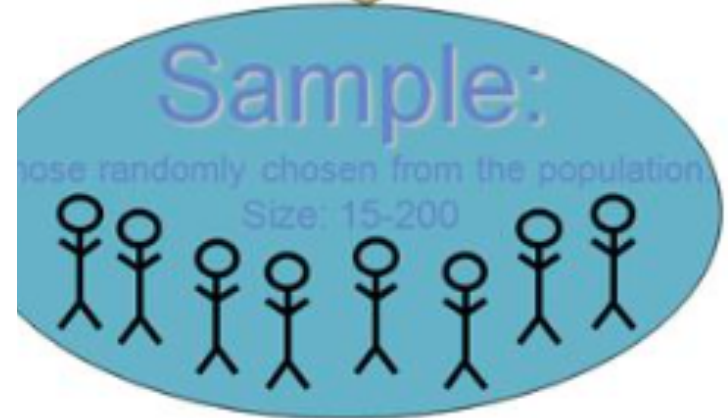
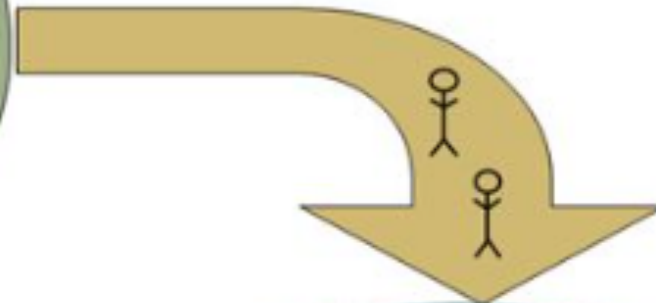
Quota Sample
Convenience Sample
Purposive Sample



Simple Random





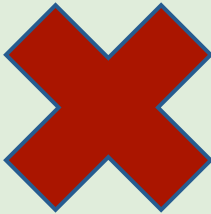

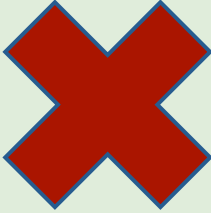
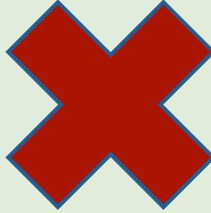
Participants are chosen randomly either through a random number table or putting all names in a hat.



100 Random Numbers

18709	85597	84933	60366	60625	12964	29390	53553	07623	45412	05487	51821	86261
09500	86665	81729	69980	05228	99483	43276	11896	32595	43940	36463	58894	91601
93478	34731	37531	55689	01214	64639	21250	51417	14032	26186	63166	78784	58489
19373	10164	11232	08028	17641	88801	75320	89206	47549	99078	71048	02023	09096
14437	98415	46481	02283	61434	30863	22577	00551	40072	21509	03755	30459	50349
17236	16573	92006	65707	18045	61030	85192	12705	77052	10569	83461	91342	41140
18305	13368	01619	36867	31122	74916	16977	64234	75579	68102	90533	96683	25118
66371	69170	87329	06296	96278	52889	83056	19114	57826				

Specs: This table of 100 random numbers was produced according to the following specifications:
Numbers were randomly selected from within the range of 0 to 99999. Duplicate numbers were allowed.
This table was generated on 1/18/2015.

	Random Sample?	Control Group?
Experimental		
Quasi-Experimental		
Non-Experimental		

Experimental Design

X - treatment

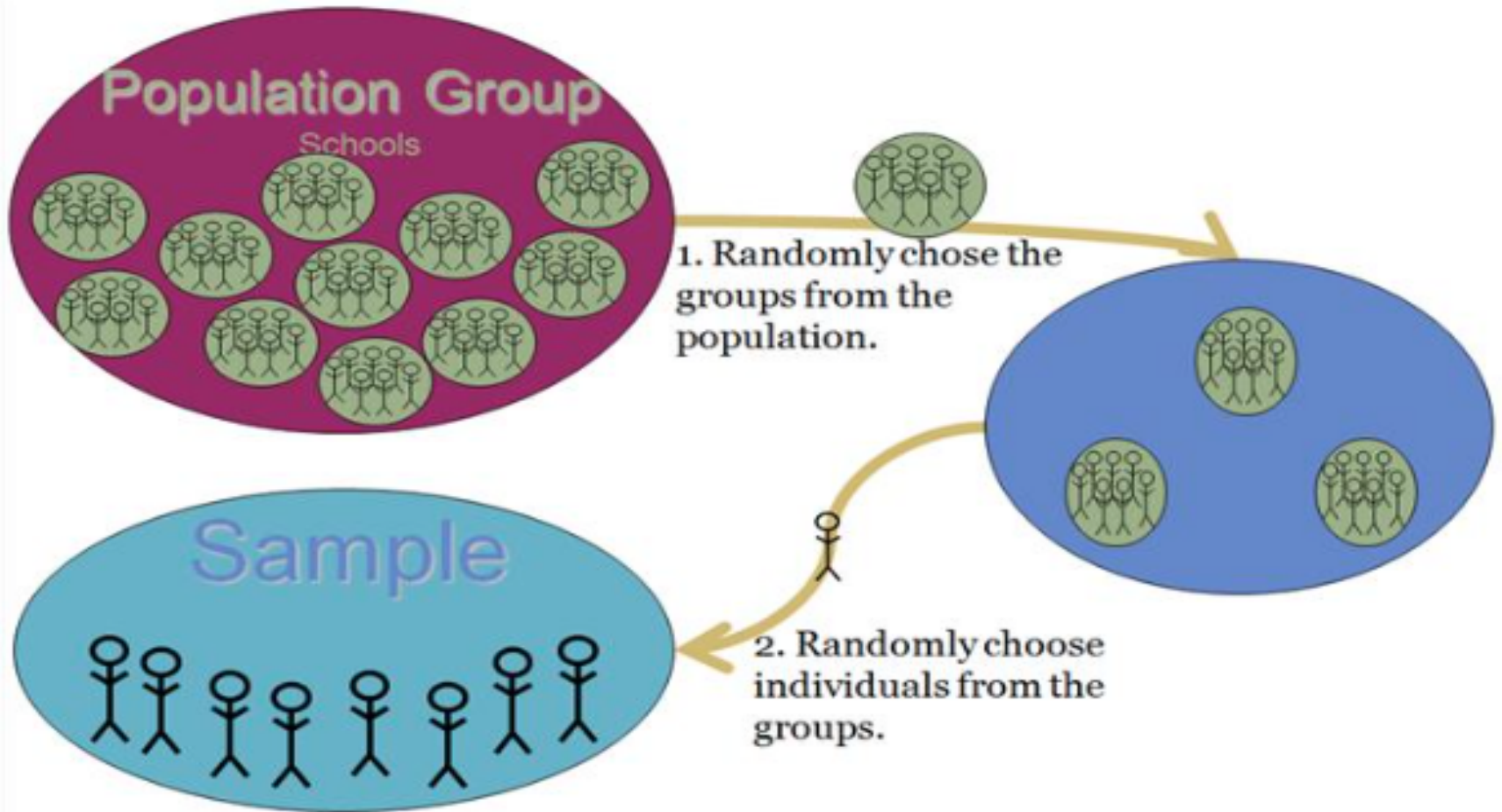
O - outcome

Good: O X O Observe, Treatment,
Observe

Better: R X O Random Sample, Treatment,
Observation

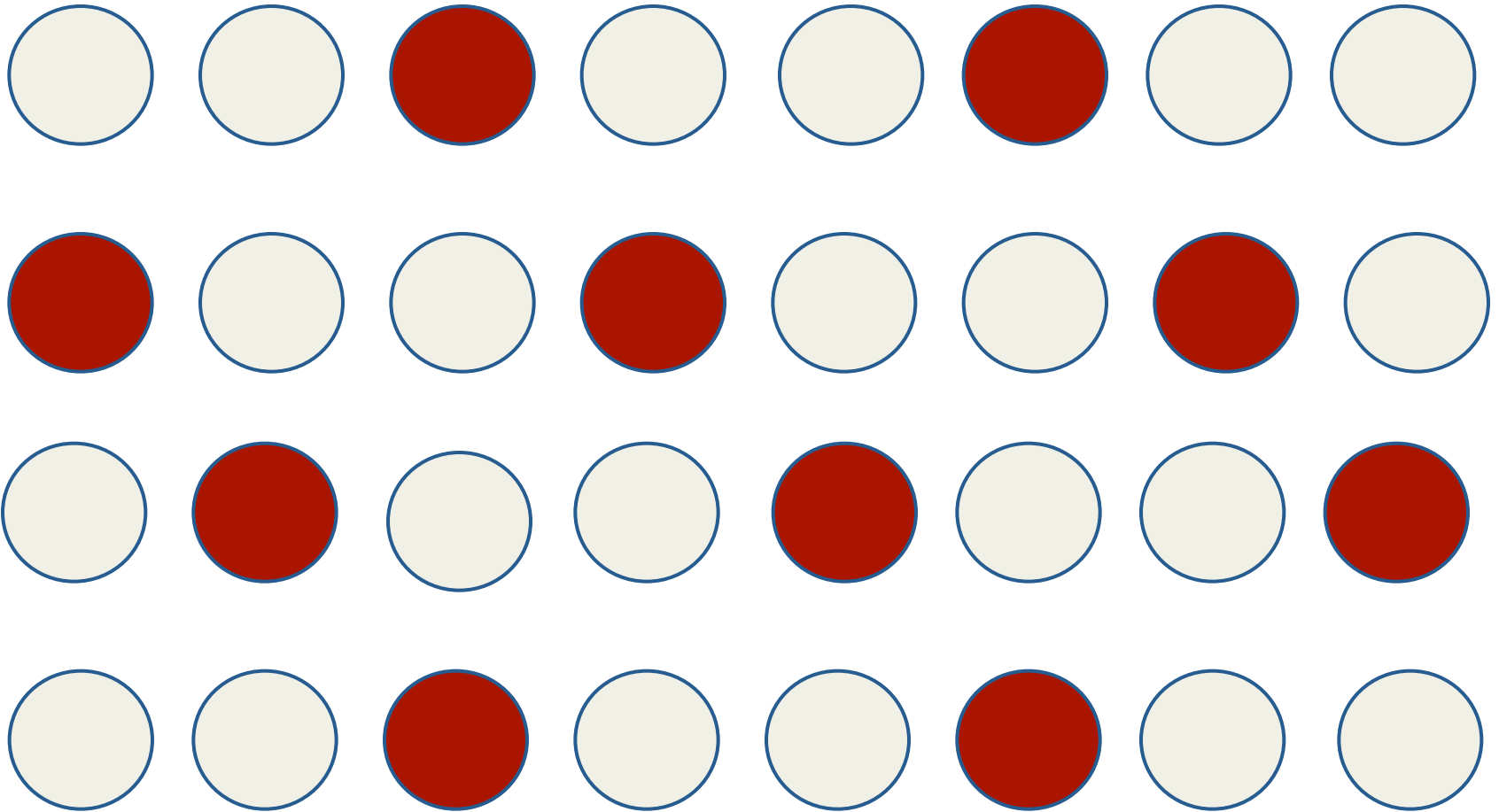
 R - O Random Sample, No
treatment, Observ

Cluster Random



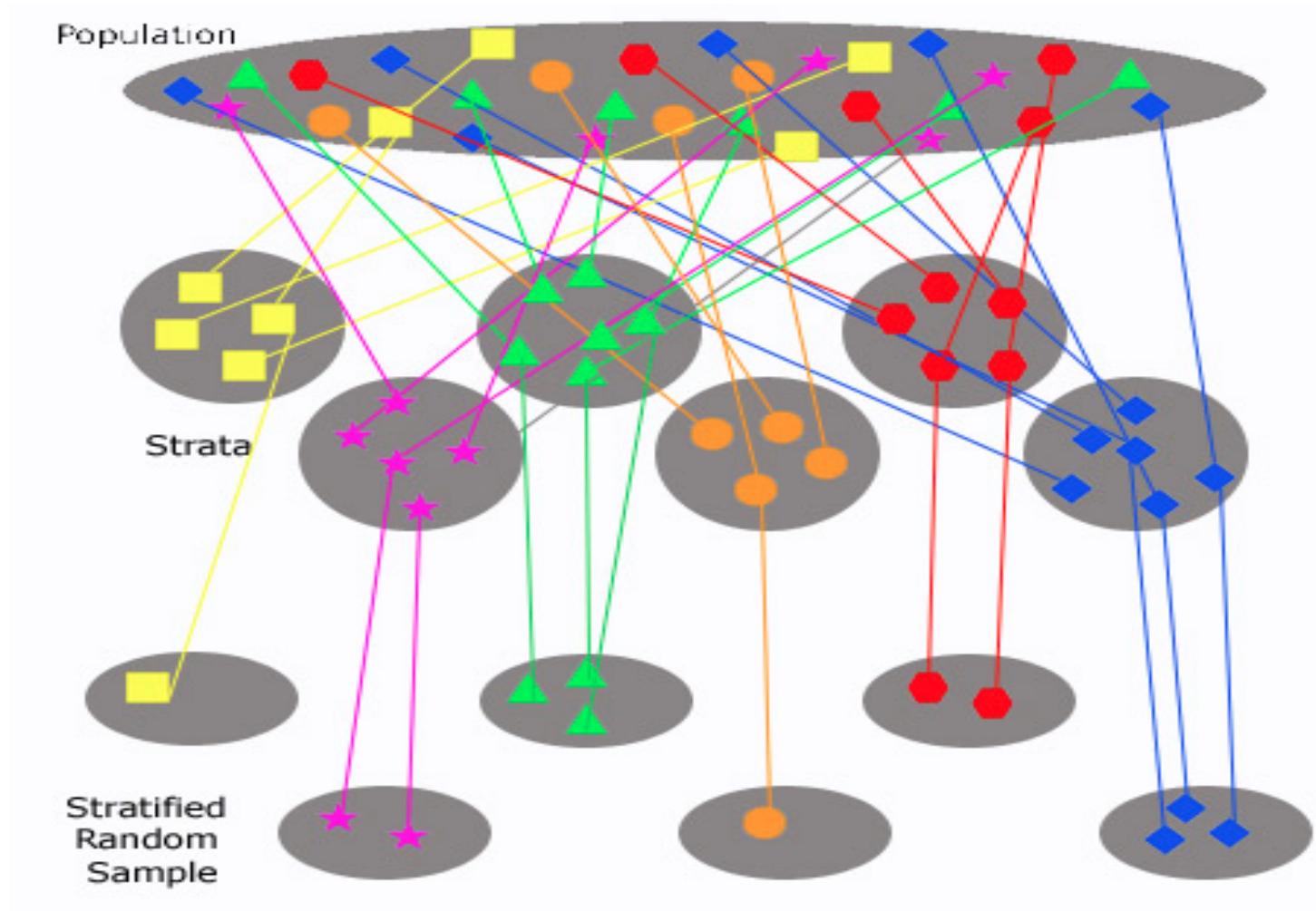
all school buildings in PA, randomly choose buildings, then randomly choose teachers from

Systematic Random



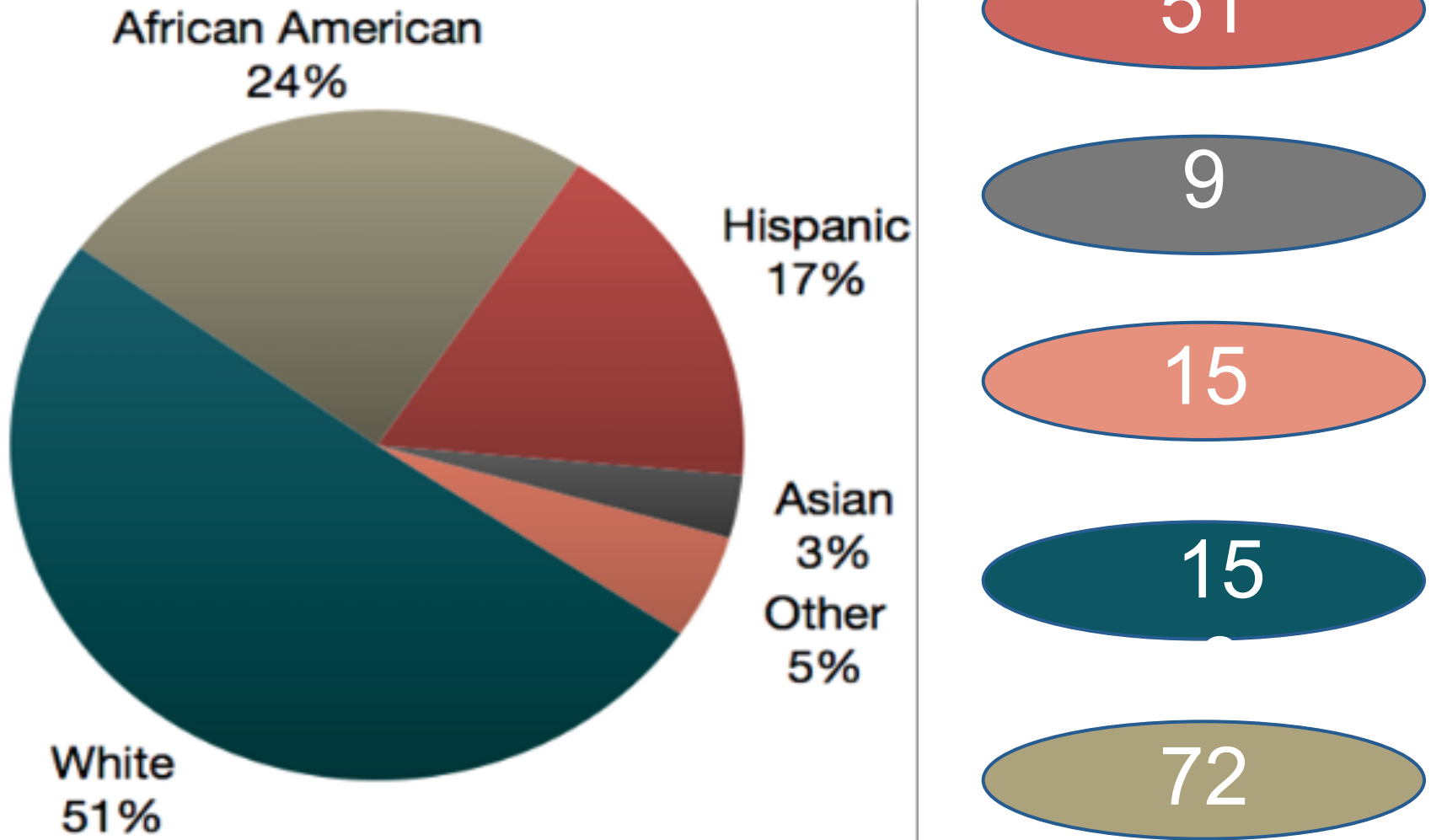
random drug test, backpack check, or survey
of students entering a school

Stratified Random



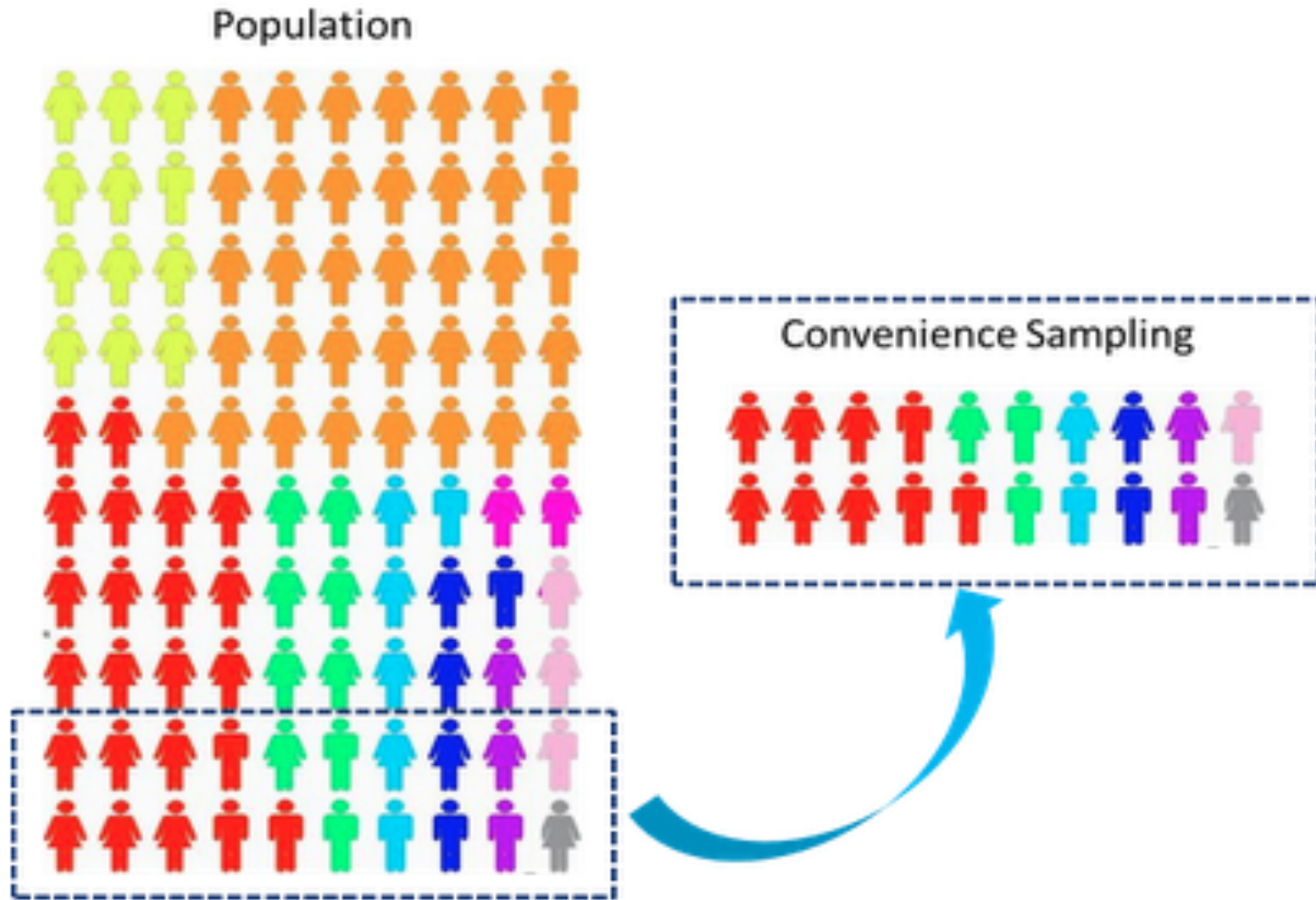
survey of all student organizations in the school district

Quota Sample



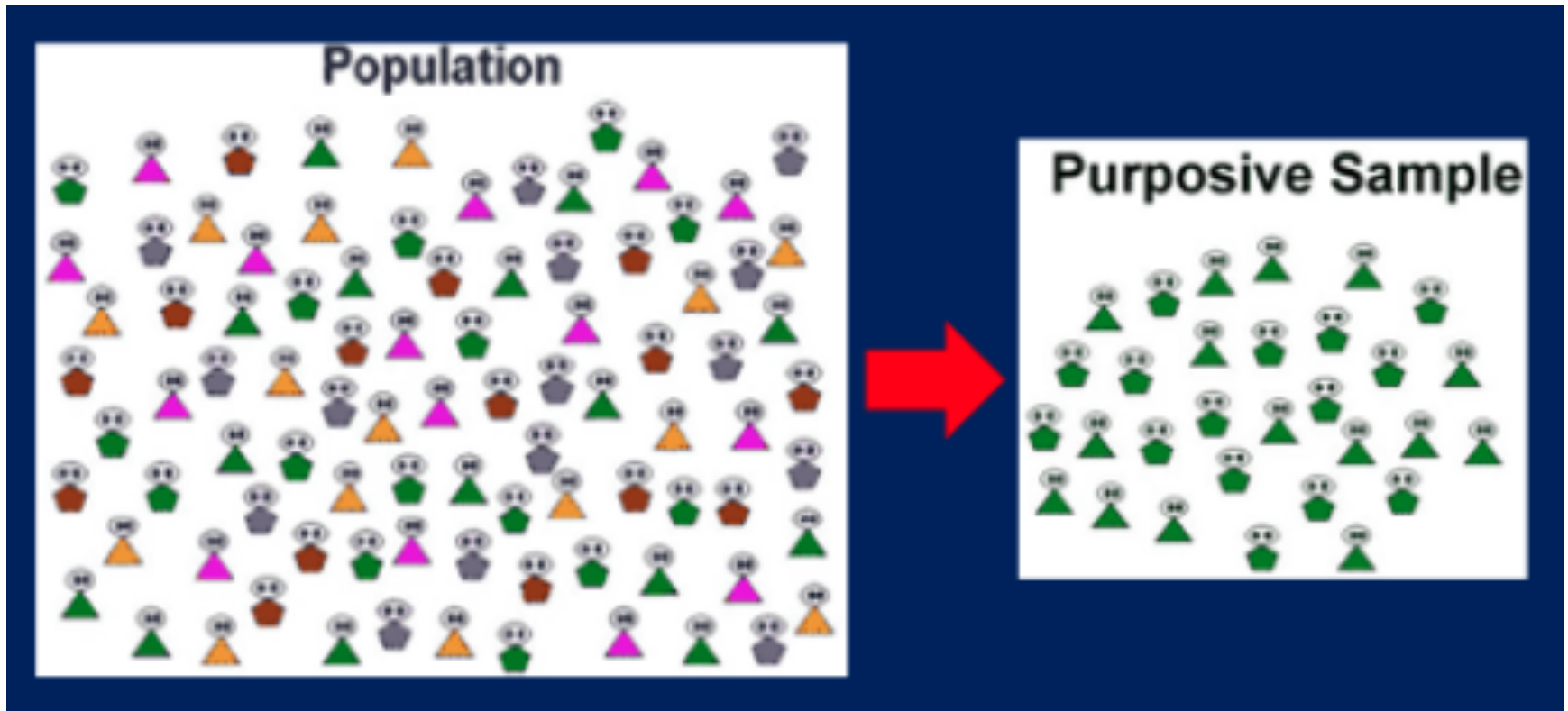
survey of all ethnic groups in a school by the percentage in which they are represented in the

Convenience Sample



PVAAS data for teachers in the district in which you
work

Purposive Sample



only want to survey the students with IEPs and
GIEPS in the district

Identifying the Variables



What is a Variable?

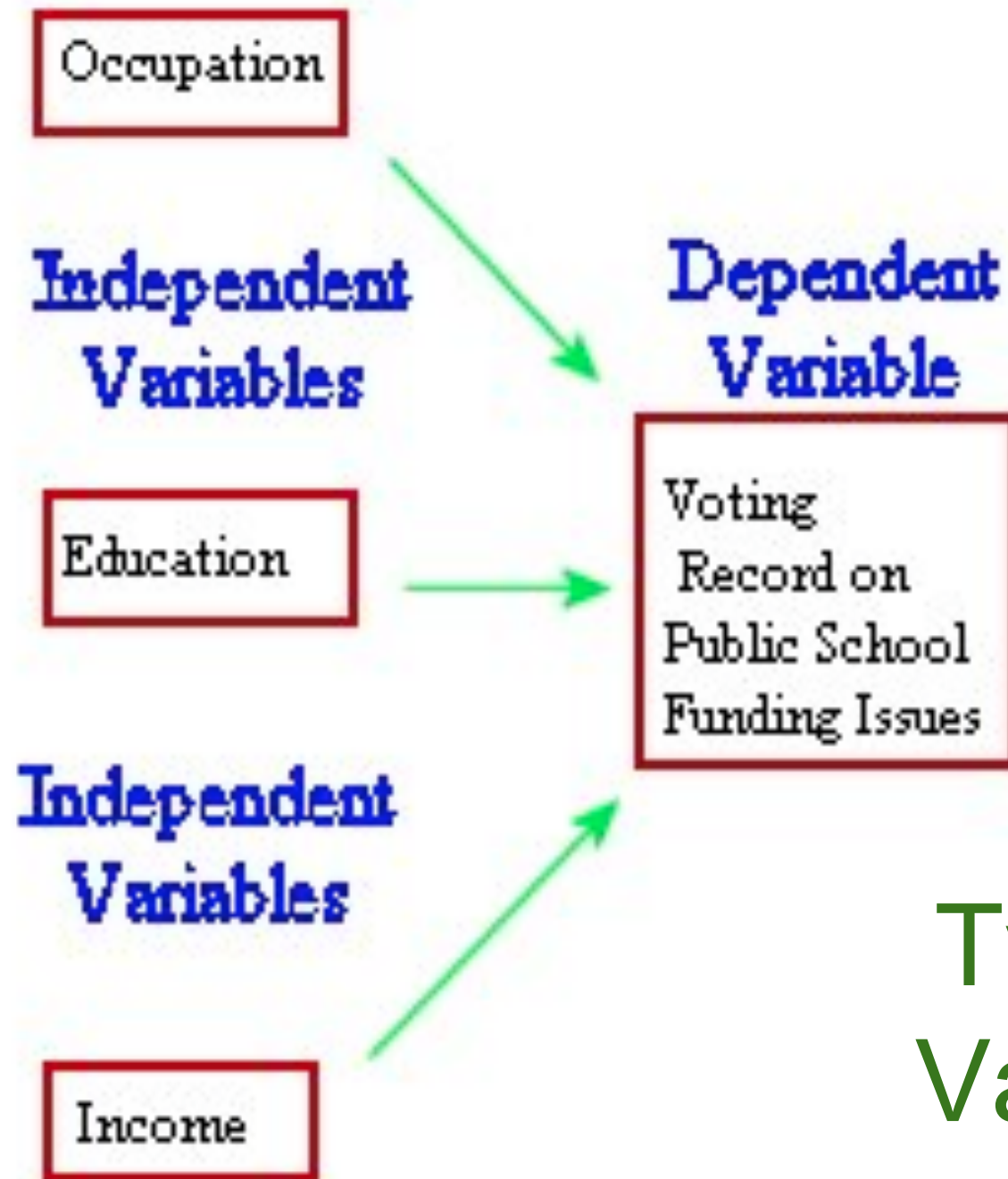
**Independent
Variable**



Influences
CHANGE
in the

**Dependent
Variable**





Types of Variables

1. The effect of teaming and ability grouping approaches on student achievement.

2. The use of SAT scores to predict freshman grade



Independent and Dependent

<http://padlet.com/klongacre/MOR>

In groups of four on one computer

Review each news brief

Write a quick suggested independent
and dependent variable for each story

Students choose more fruits, eat more veggies, data show

Harvard School of Public Health researchers who inspected more than 1,000 lunch trays at four schools found that students chose 23% more fruits and ate 16% more vegetables after U.S. Agriculture Department school-nutrition rules were issued in 2012. The study in the American Journal of Preventive Medicine did not find an increase in wasted food.

[Medical News Today](#) **[NBC News](#)**

Lower Dauphin School District experiments with hybrid classroom

A fourth-grade teacher is piloting a hybrid classroom in the Lower Dauphin School District, and he told the school board Monday night that so far students are responding well. The hybrid classroom uses a combination of direct instruction by the teacher, collaborative work by student groups and computer technology.

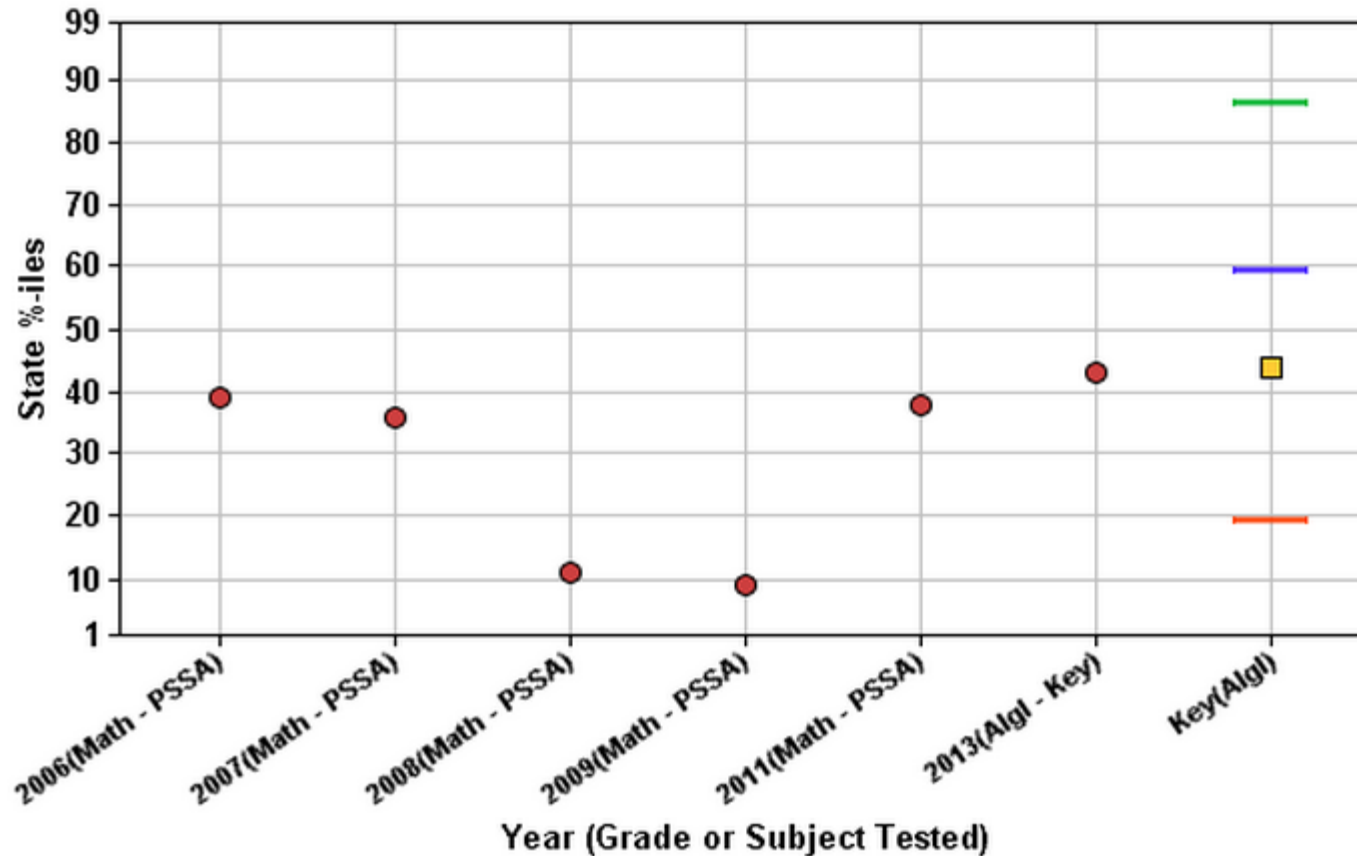
Harrisburg Patriot-News, March 4, 2014

How iPads have changed the workflow **at one Illinois middle school**

Sixth-grade teachers at Highcrest Middle School in Wilmette, Ill., say iPads have shortened transition times in class, improved student organization and offered new ways to learn. Two students and three teachers, including teacher Amanda Knicker, told the district school board about the iPad pilot program, in which students turn in and receive graded assignments on the tablets and can change directions in class without having to go to their lockers for new books. "It really helps with [workflow] in our classrooms," Knicker said.

[Chicago Sun-Times \(free registration\)/Wilmette Life](#)

Possible independent variables



- Student's Observed %-ile
- Student's Projected Keystone(Algebra I) %-ile
- Keystone Algebra I (Basic)
- Keystone Algebra I (Proficient)
- Keystone Algebra I (Advanced)

Too intertwined to determine Independent & Dependent

1. Relationship between attitude & achievement
 - a. Do positive attitudes cause high achievement or does high achievement cause positive attitudes?
2. Relationship between creativity & critical thinking
 - a. Do high levels of creativity cause higher levels of critical thinking or do higher levels of critical thinking cause greater creativity?

Levels of Measurement

Qualitative

Quantitative

© 2012 Rey Ty

Nominal Scale

Mode, chi square

Female
Male

Ordinal Scale

Median, percentile

First
Second

Ratio Scale

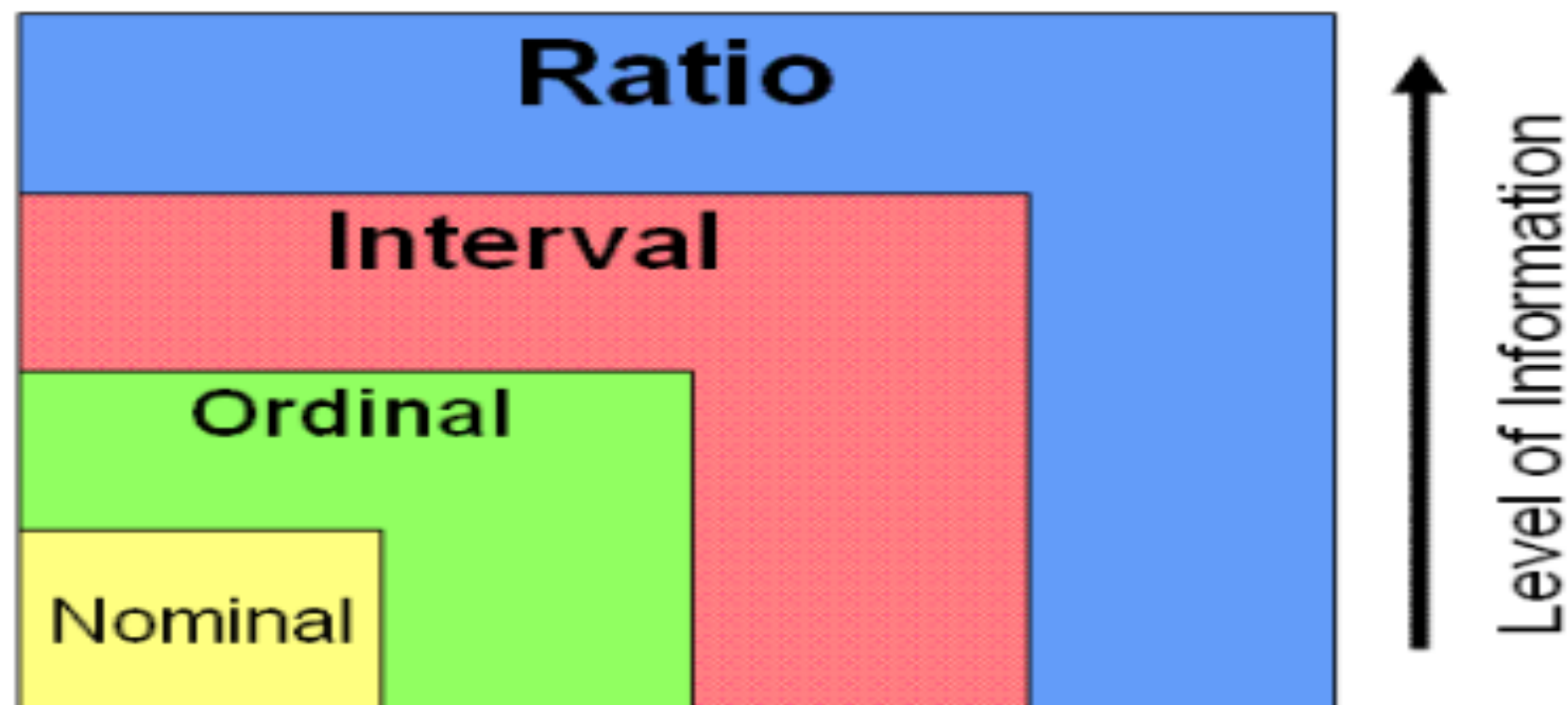
Mean, standard deviation, correlation,
regression, analysis of variance

1 inch stands for 1 mile

Interval Scale

Geometric mean, harmonic
mean, coefficient of variation, logarithms

Dates, intelligence & personality scores;
money; sea level; temperature; years



Nonparametric Parametric
(qualitative data) (quantitative data)



I am a bird.
I am yellow.
I am awesome.



I am a seahorse.
I am orange.
I am super awesome.



I am a T-rex.
I am green.
I am extinct.

Categorical

Are you in pain?



0
very happy,
I do not hurt
at all



1 - 2
hurts just
a little
bit



3 - 4
hurts a
little more



5 - 6
hurts even
more



7 - 8
hurts a
whole lot



9 - 10
hurts as much as
you can imagine,
you don't have
to be crying to
feel this bad

Freshman
SOPHOMORE
Junior
SENIOR



Ordinal



Interval





Ratio

Discrete (unordered) items...



... **not** continuous



OK to compute....	Nominal	Ordinal	Interval	Ratio
frequency distribution.	Yes	Yes	Yes	Yes
median and percentiles.	No	Yes	Yes	Yes
add or subtract.	No	No	Yes	Yes
mean, standard deviation, standard error of the mean.	No	No	Yes	Yes
ratio, or coefficient of variation.	No	No	No	Yes

Type of data determines the type of statistics

EVERYBODY WHO WENT TO
THE MOON HAS EATEN
CHICKEN!

Relationships Between Variables

GOOD GRIEF.
CHICKEN MAKES
YOU GO TO
THE MOON!

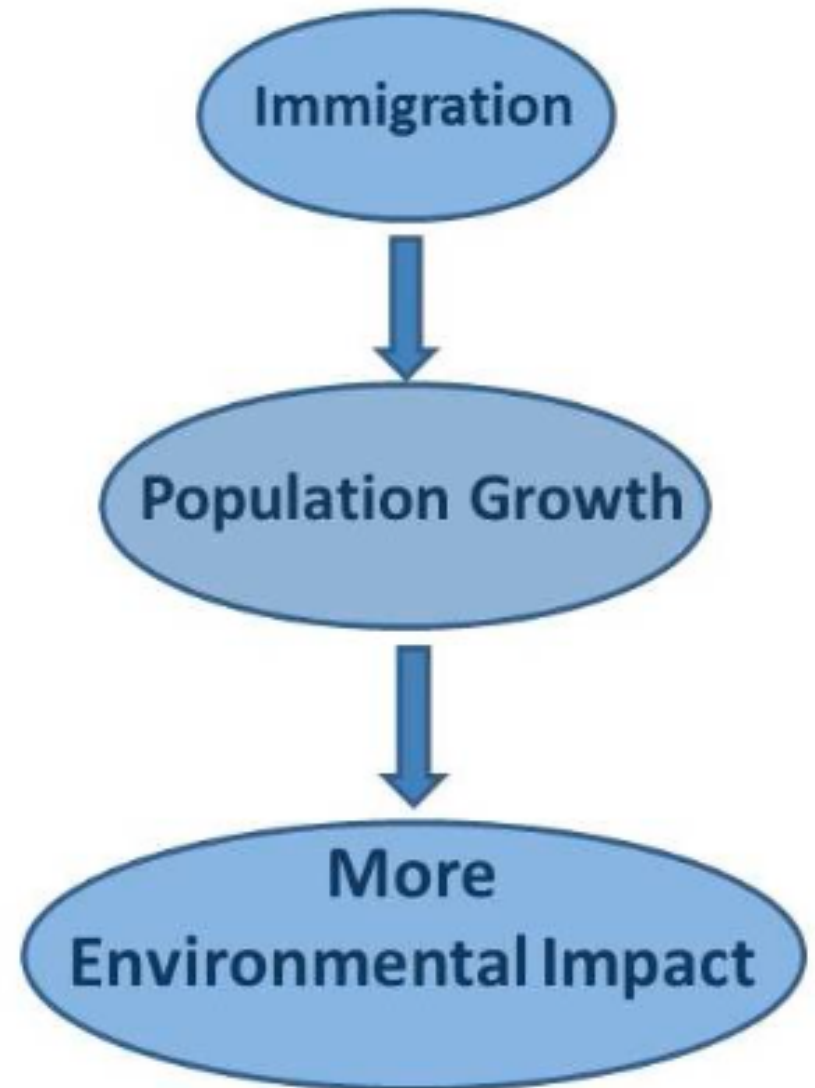


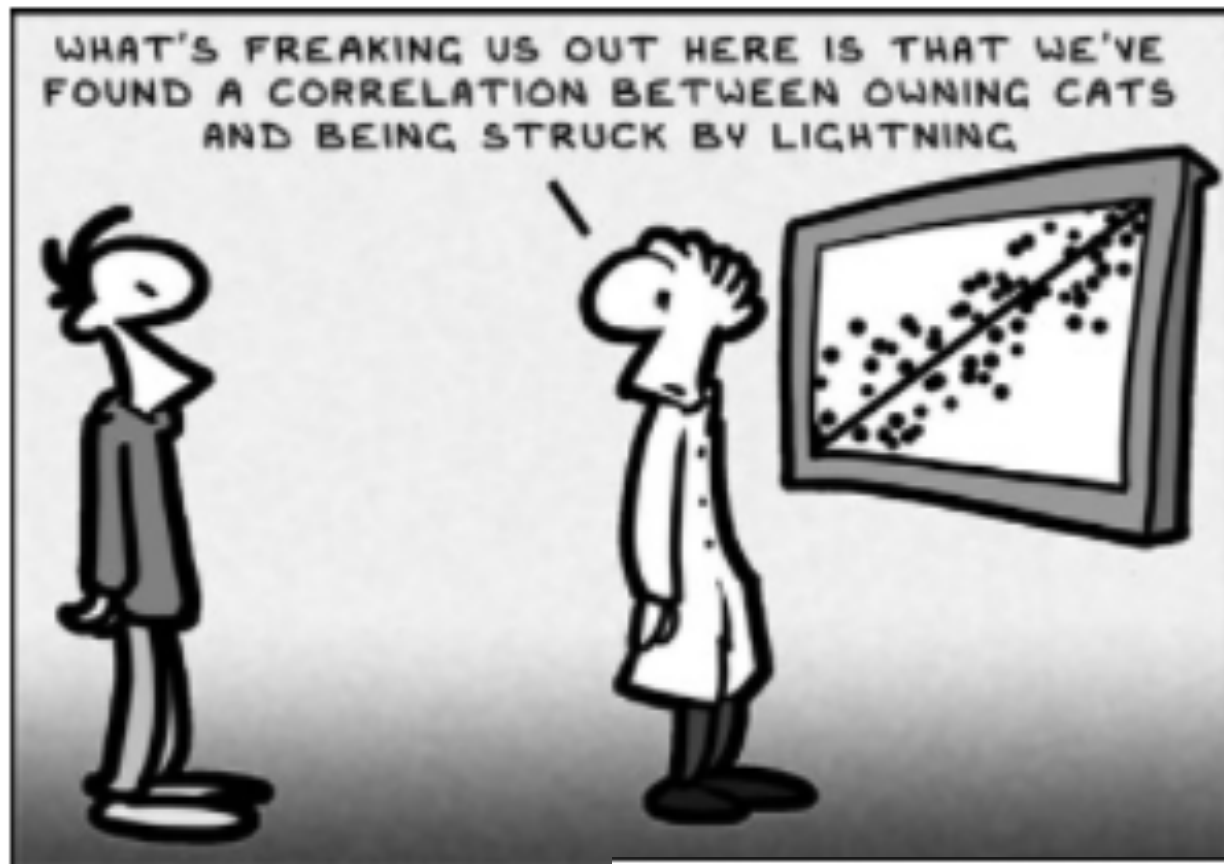
Causal Relationship

THE FAMILY CIRCUS



"I wish they didn't turn on that seatbelt sign so much! Every time they do, it gets bumpy."





Correlational Relationship

<http://myhome.iolfree.ie/>

I USED TO THINK
CORRELATION IMPLIED
CAUSATION.



THEN I TOOK A
STATISTICS CLASS.
NOW I DON'T.

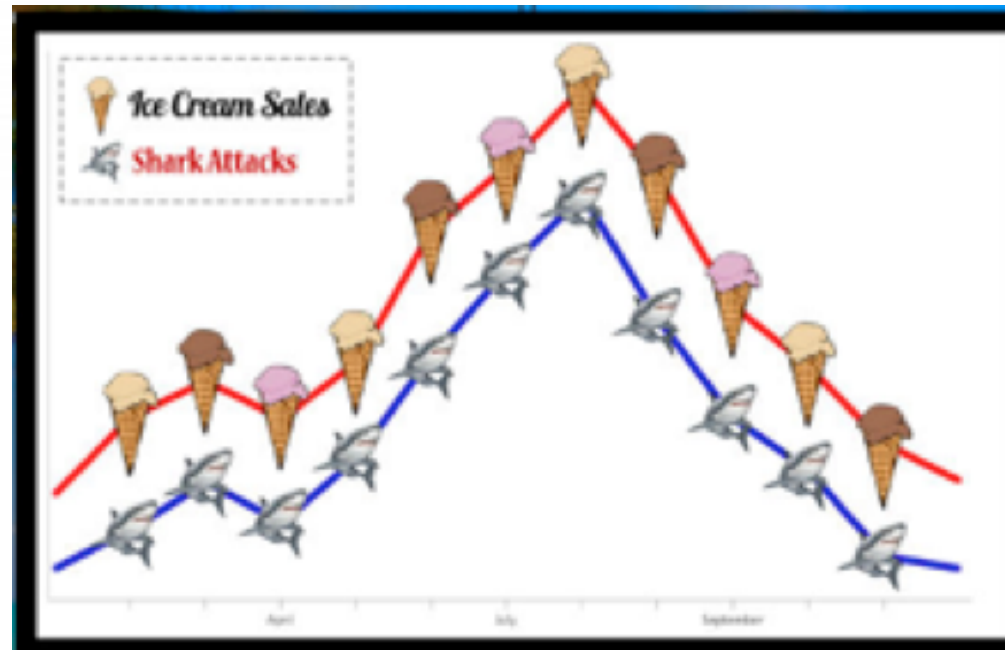
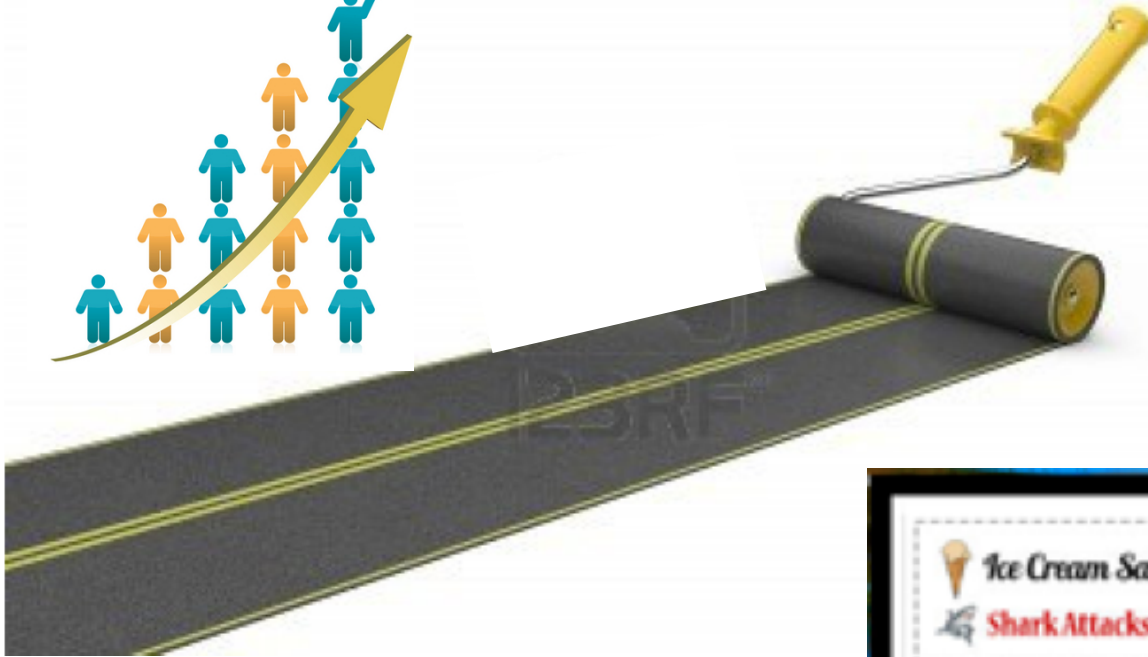


SOUNDS LIKE THE
CLASS HELPED.
WELL, MAYBE.



Third Variable Problem

a type of confounding variable that causes a mistaken causal relationship between two others



Moneyball



Brain Break!



CASEL Study p. 405 - 412

1. Research Question?

2. Research Method?

“Population” = SEL programs

1. Time Frame of programs?

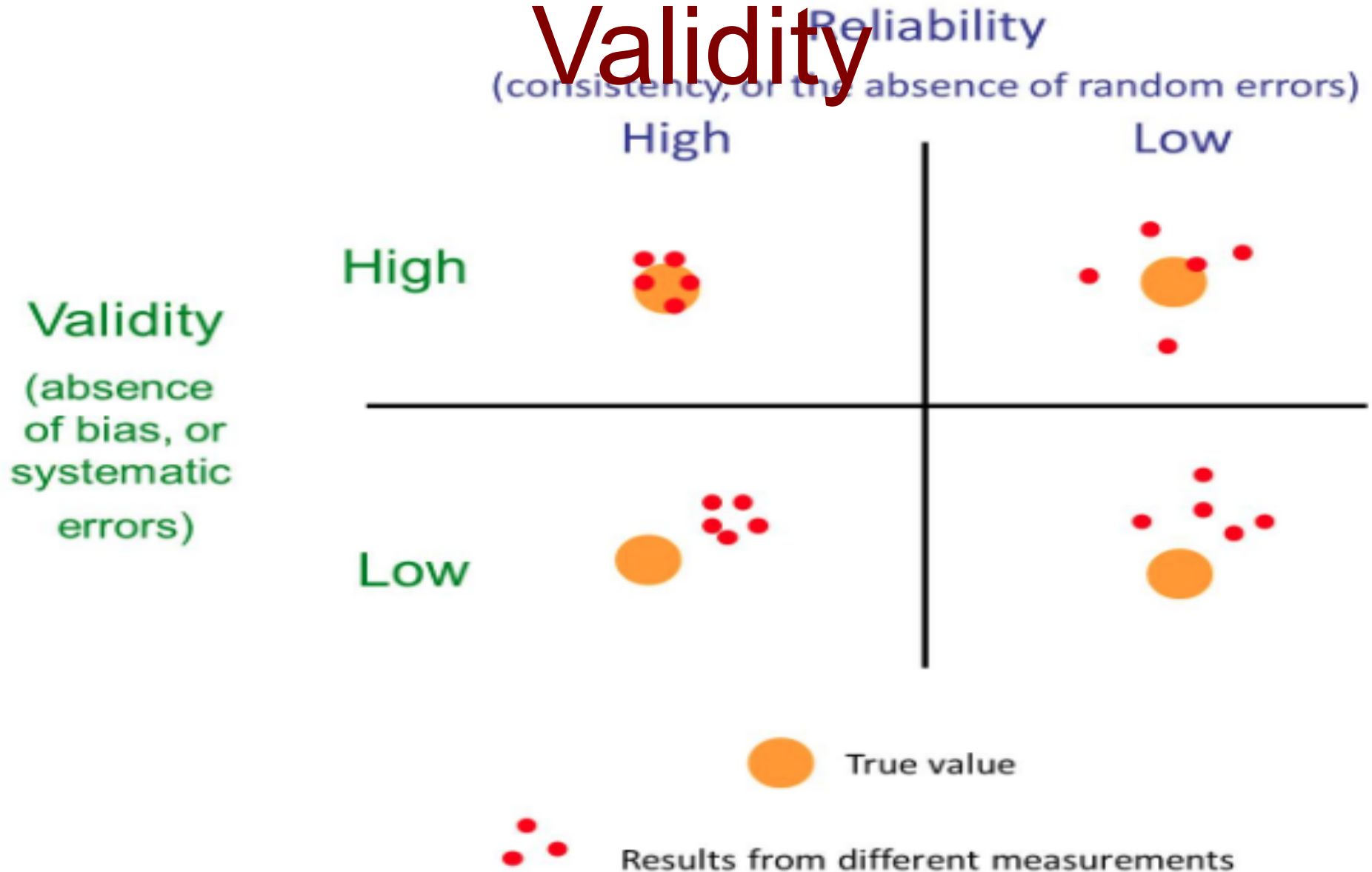
2. Five hypotheses?

3. Program Sampling/Data Collection?

4. Inclusion and Exclusion Criteria?

5. Overall Impression of information

Establishing Reliability & Validity



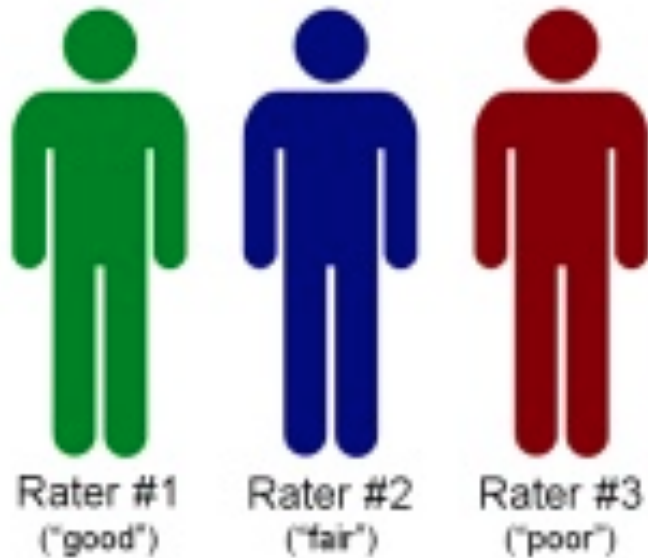
<http://www.youtube.com/watch?v=pXHE4wok8Pk>



Reliability



CONSISTENCY of results -
Can this study be replicated with same results?

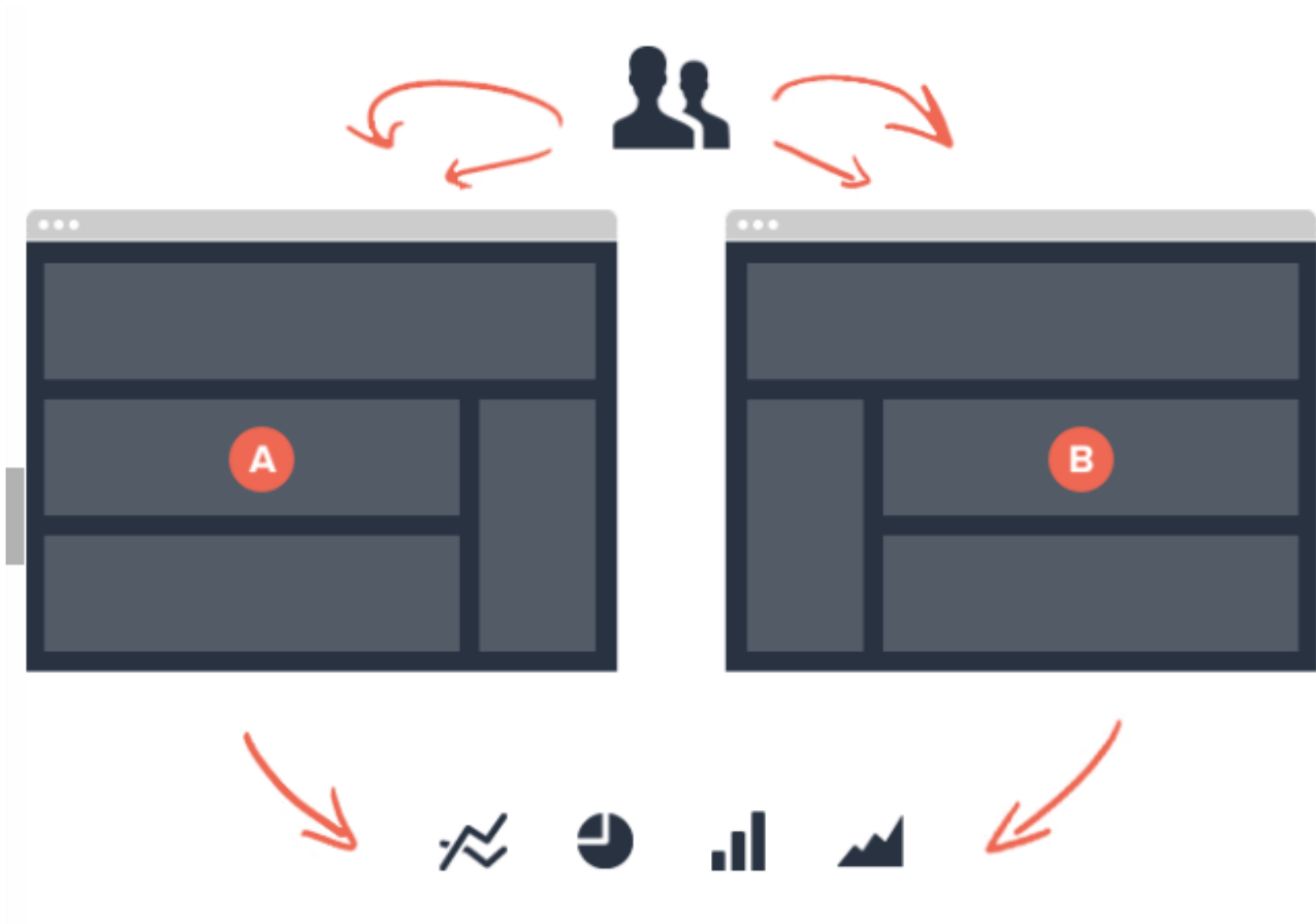


Reliability in CASEL - pg 410

Kappa Statistic κ

Value of K	Strength of agreement
< 0.20	Poor
0.21 - 0.40	Fair
0.41 - 0.60	Moderate
0.61 - 0.80	Good
0.81 - 1.00	Very good

Inter-rater Reliability



Parallel Testing



measure

=



measure

Time
interval
important



time 1

time 2

Test-Retest

Ex:
Keirsey
Personality
Test -
INFJ

Reliability in CASEL - pg 410

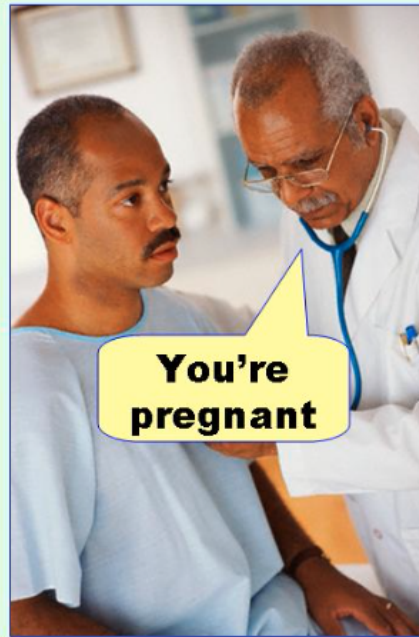
- Alpha Statistic α (.05 = 95%)

- Type I error
- See things that aren't there

- Beta Statistic β

- Type II error
- Don't see things that are there

Type I error
(false positive)



Type II error
(false negative)



Validity



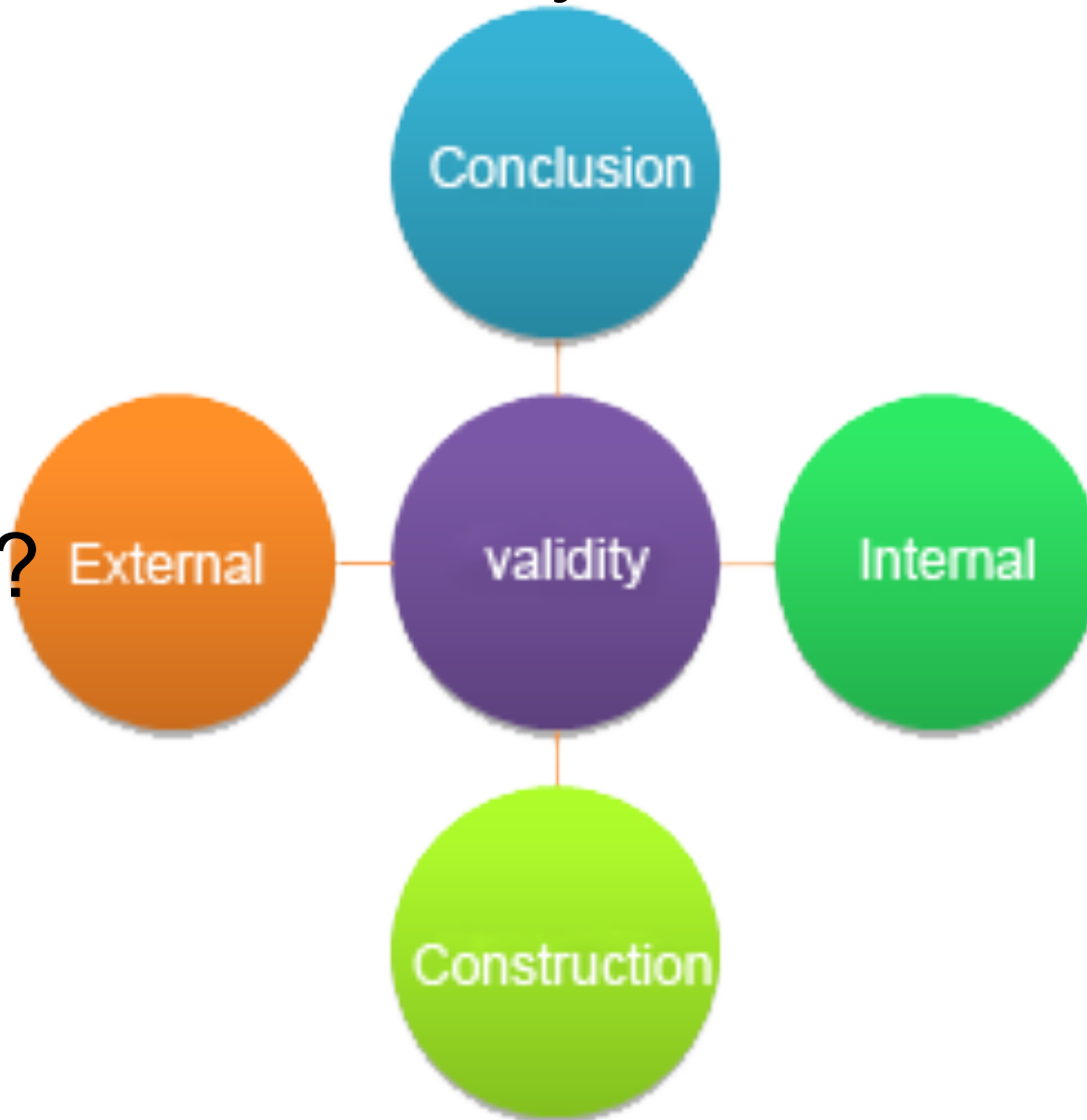
TRUTHFULNESS of results -
Is it measuring what it says it will?

Analysis?

Sampling?

Design?

Measurement



Internal Validity

- Has to do with DESIGN and how the constructs are related (will you get the same results in the same setting?)
- Correlation does not necessarily equal Causation
 - **Ambiguous Temporal Precedence**
 - **Selection**
 - **History**
 - **Maturation**
 - **Regression**
 - **Attrition**
 - **Testing**
 - **Instrumentation**
 - **Additive vs Interactive Effects**

Conclusion Validity

- Has to do with ANALYSIS (p = between -1 and 1)
- Is there an actual relationship between the two variables?
 - **Low Statistical Power**
 - **Fishing and Error Rate**
 - **Unreliability of Measures**
 - **Restriction of Range**
 - **Extraneous Variance in Setting**
 - **Heterogeneity of Units**

Construct Validity

- Has to do with having a common agreement upon the DEFINITION of the construct
- Did you measure the outcome you wanted to measure?
 - **Construct Confounding**
 - ***Mono-Operation & Mono-Method Bias***
 - **Compensation**
 - **Treatment Diffusion**
 - **Reactivity**

External Validity

- Has to do with SAMPLING and transfer of results to other settings (generalizability)
- Are you able to generalize the outcome to the larger population?
 - Interaction of the Causal Relationship (lotCR) with
 - Units
 - Treatment Variations
 - Outcomes
 - Settings
 - Context-Dependent Mediation

Threats to Reliability & Validity

- Randomly select a popsicle stick from the pile.
- Research your “threat”. Create a 4 line catch phrase to explain your “threat”. *Bonus points if it rhymes
- Find a visual.
- Devise a relevant educational example.
- Place information in the designated slide within the google presentation shared with the class.

Validity in CASEL - pg 410

- Did authors state the measures:
 - construct validity
 - agreement on definition of terms
 - concurrent validity
 - can test be used to predict other outcomes
 - predictive validity
 - can score predict score on later criterion test

Brain Break!



<http://www.weareteachers.com/blogs/post/2015/01/29/17-more-things-you-can-do-while-actively-monitoring-a-standardized-test>

Day 4





Methods of Data Collection

- Interview or survey participants
- Administer self-developed instrument
- Record naturally occurring data (observe)
- Record available data
- Administer standardized instrument

<http://wilderdom.com/tools.html>

Considerations:

- Highest reliability
- Highest validity
- Greatest ease of administering
- Greatest ease of scoring
- Greatest ease of interpreting
- Does it measure what you said you were going to measure?

<http://wilderdom.com/tools/ToolsHowChoose.html>

HELLO, DO YOU HAVE ANY
OPINIONS THAT FIT INTO
OUR PRECONCEIVED
QUESTIONS?

THANK
YOU!

YES AND NO...

WWW.DOUBT.IT



Writing
Your Own
Questions

Ted Talks

Dan Ariely: [Are We In Control Of Our Own Decisions?](#)



Selecting an Instrument



Types of Instruments

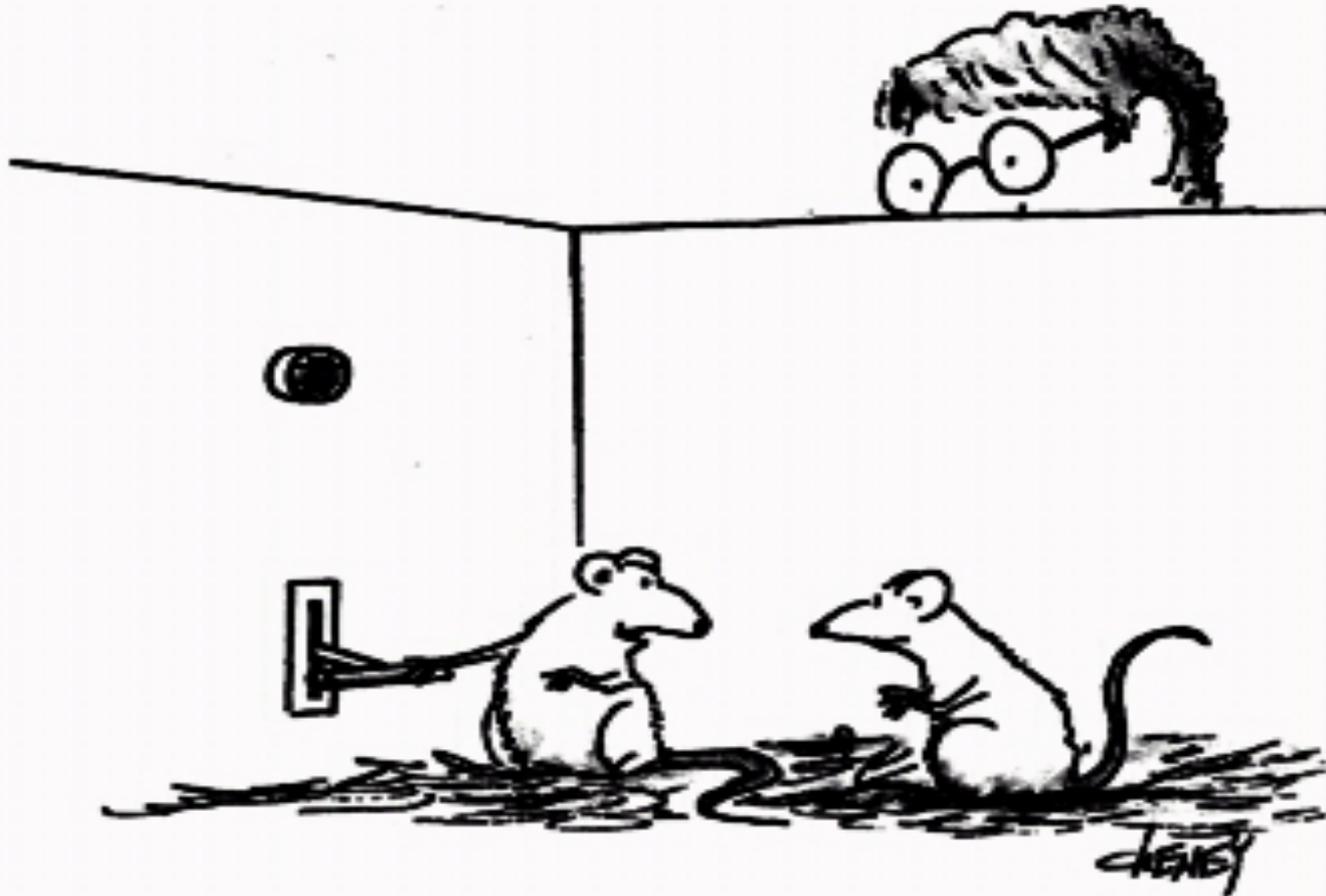
<http://wilderdom.com/tools.html>

Type	Definition	General Example	Specific Examples from
1. Cognitive	Measures attainment in academic areas	<ul style="list-style-type: none">- Achievement tests- Aptitude tests	
2. Affective	Assess feelings, values, and attitudes	<ul style="list-style-type: none">- Personality Inventories- Attitude tests- Values tests	
3. Projective	Measures thoughts and feelings to ambiguous stimulators	<ul style="list-style-type: none">- Associational tests	

Brain Break!



Analyzing Data



It's a rather interesting phenomenon. Every time I press this lever, that post-graduate student breathes a sigh of relief.

© Original Artist

SURVEY Reproduction rights obtainable from
www.CartoonStock.com



search ID: form1021

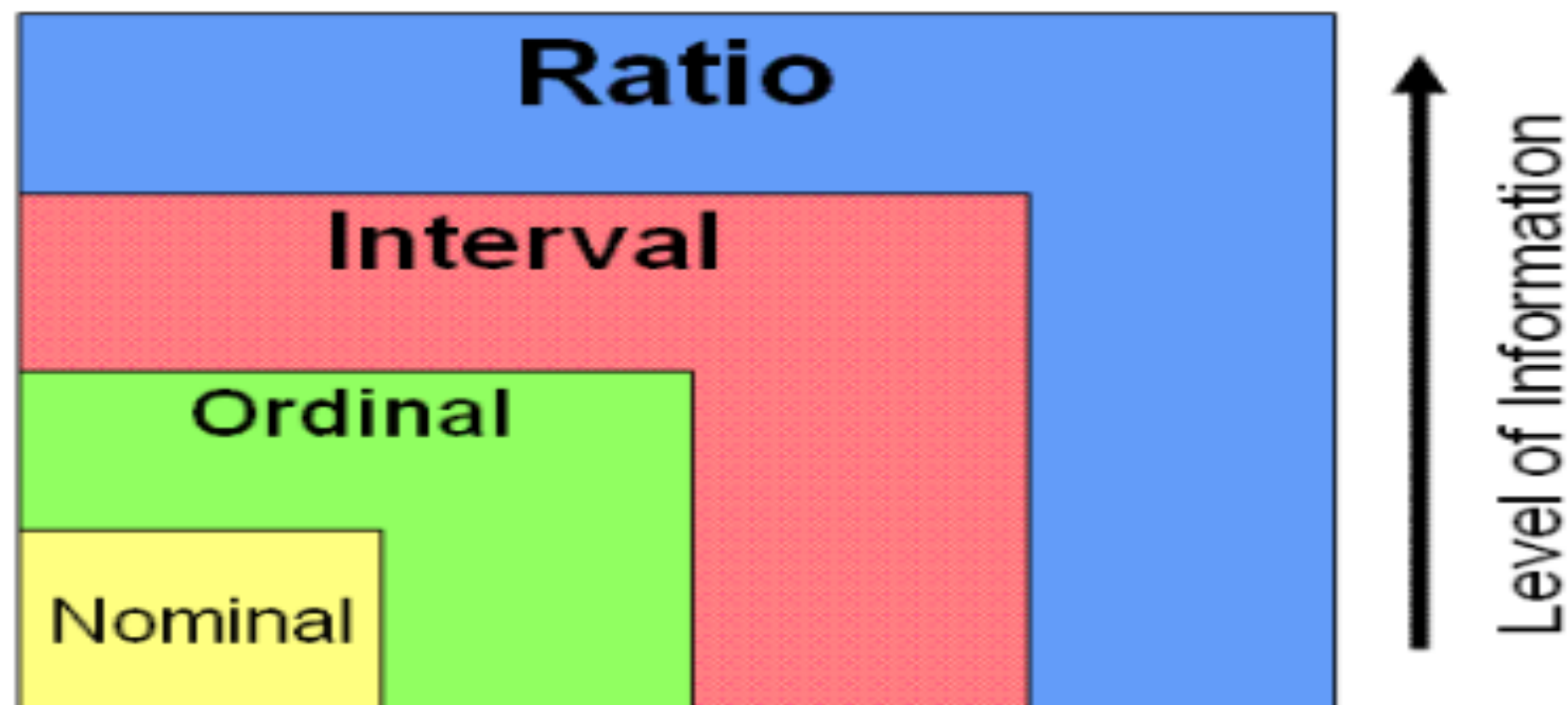
**87% OF THE 56% WHO COMPLETED MORE
THAN 23% OF THE SURVEY THOUGHT IT
WAS A WASTE OF TIME**

Classifications of Data

Types of Empirical Research

Qualitative (Categorical) vs. Quantitative

	Qualitative Research	Quantitative Research
Objective	<ul style="list-style-type: none">• Gain and understanding of underlying reasons or motivations.• Uncover trends or provide insights into the setting of a problem.	<ul style="list-style-type: none">• Quantify data and generalize results from a sample from the population of interest.• Measure the incidence of a particular occurrence, view or opinion in a chosen sample.
Sample	Usually a small number of non-representative cases. Subjects can be chosen deliberately to test a particular theoretical premise.	Usually a large number who are randomly selected and representing the population of interest.
Data Analysis	Non-statistical; data cannot be expressed as a number.	Statistical; data can be expressed as a number.
Example	Temperature = "cold" Height = "Tall"	Temperature = 9° Fahrenheit Height = 6' 8"



Nonparametric Parametric
(qualitative data) (quantitative data)

Analyzing Quantitative Data

- Give numerical representation to information
- Descriptive Statistics
 - Describes what is happening a data set
 - Need entire population
 - Mean, Median, Mode, Standard Deviation, Variance
- Inferential Statistics
 - Determining what is happening in a population
 - Predicting what may happen in the future
 - Need only a sample of the population

Raw Score vs Scaled Score

Raw Score:

score without any
type of adjustment

Scaled Score:

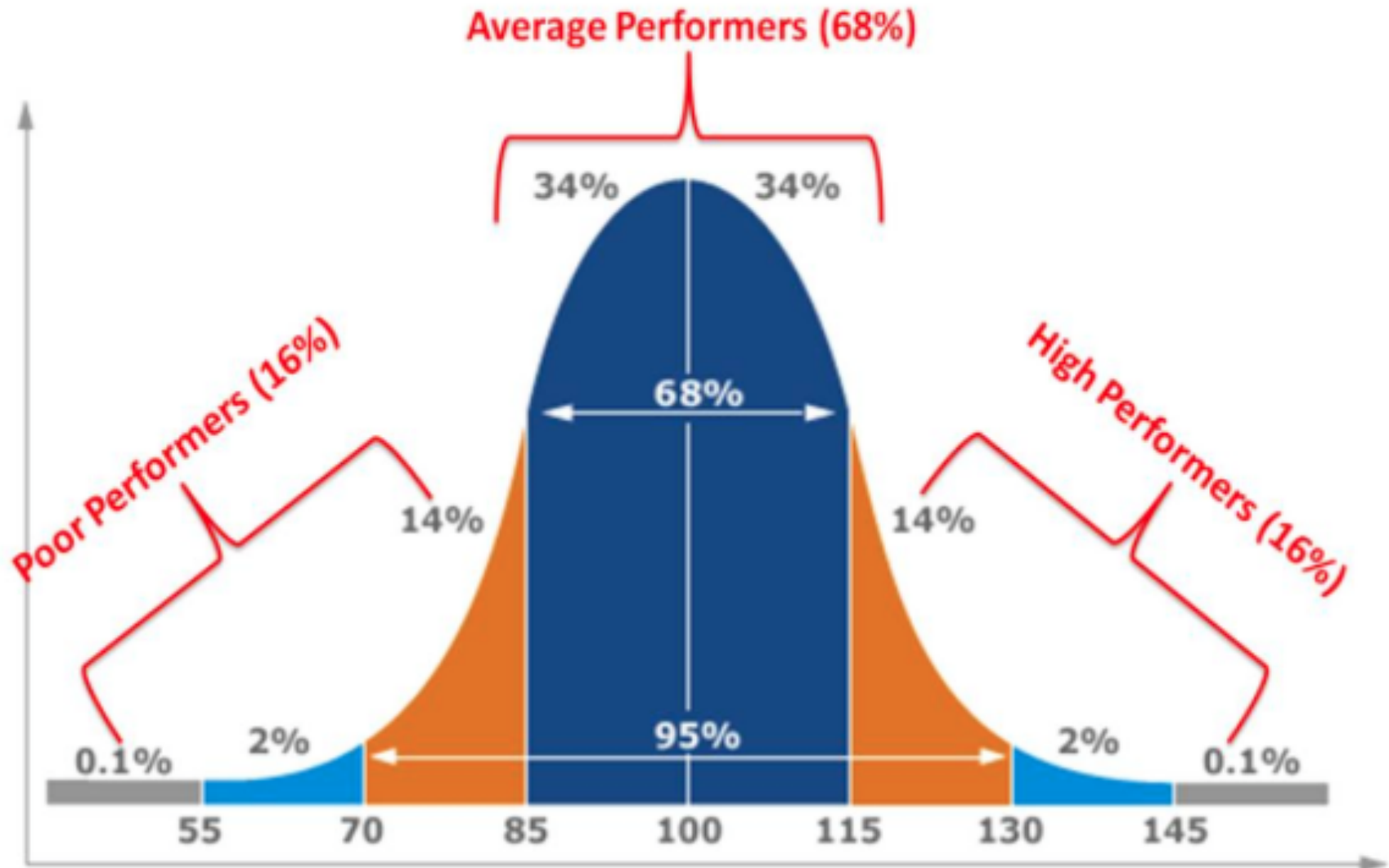
score that is transformed
to report scores of two
tests on a consistent
basis

New SAT & ACT Score Comparison

ACT <i>If you scored...</i>	CURRENT SAT <i>or a...</i>	NEW SAT <i>It's about the same as a...</i>
36	1600	2400
35	1560-1590	2340
34	1510-1550	2260
33	1460-1500	2190
32	1410-1450	2130
31	1360-1400	2040
30	1320-1350	1980
29	1280-1310	1920
28	1240-1270	1860
27	1210-1230	1820
26	1170-1200	1760
25	1130-1160	1700
24	1090-1120	1650
23	1060-1080	1590
22	1020-1050	1530
21	980-1010	1500
20	940-970	1410
19	900-930	1350
18	860-890	1290
17	810-850	1210
16	760-800	1140
15	710-750	1060

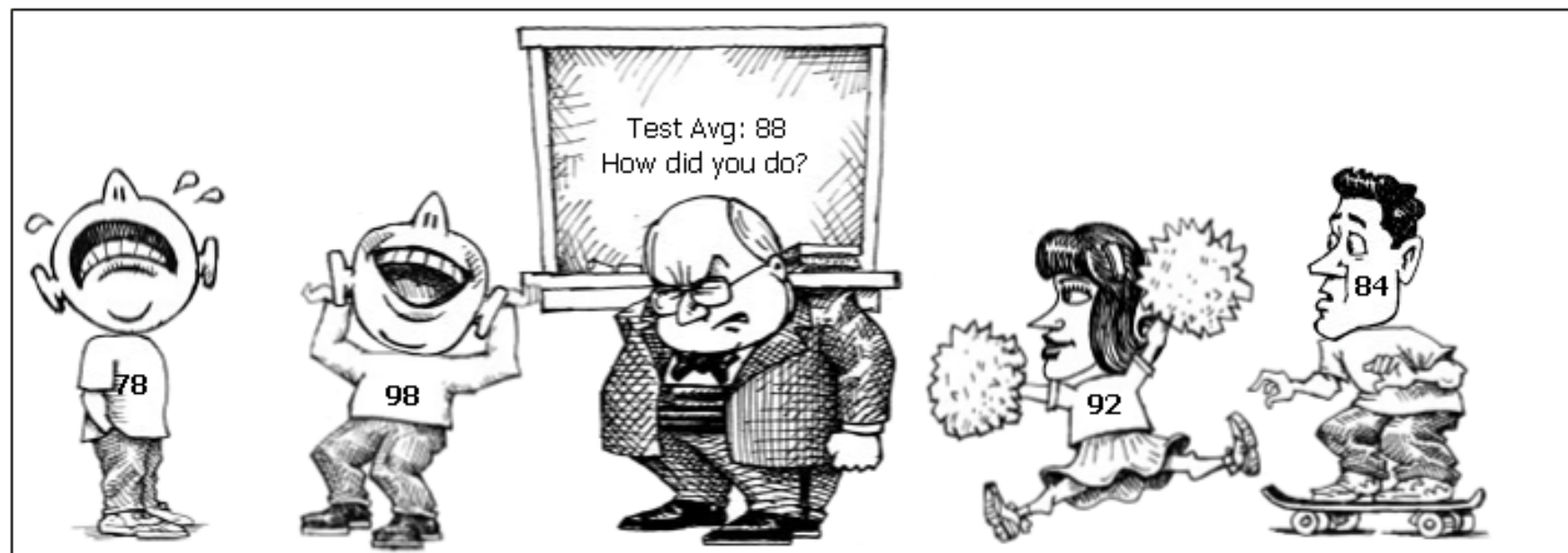
Types of Tests

1. Norm Referenced Test



The IQ and SAT are norm-referenced tests - your score is compared to how others have done.

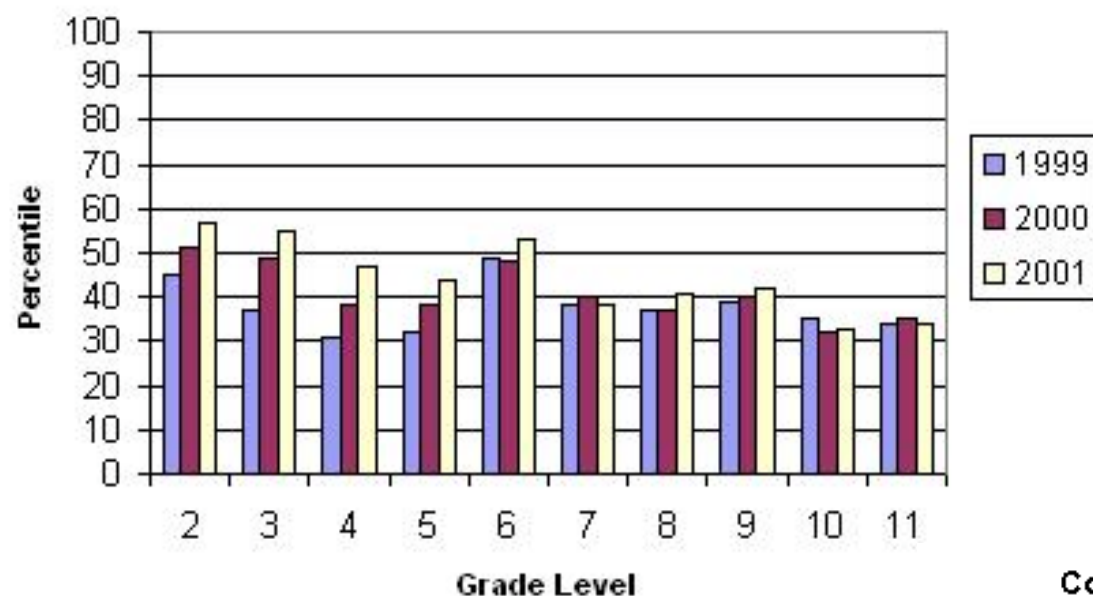
Norm-referenced by Paul Keller



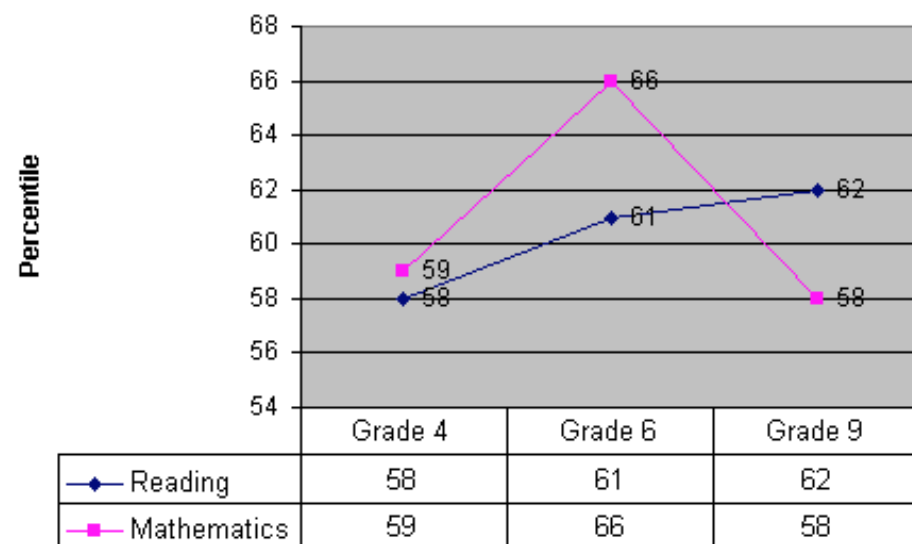
2. Criterion Referenced Test



Figure 2: Percentile Rankings on State Test Mathematics



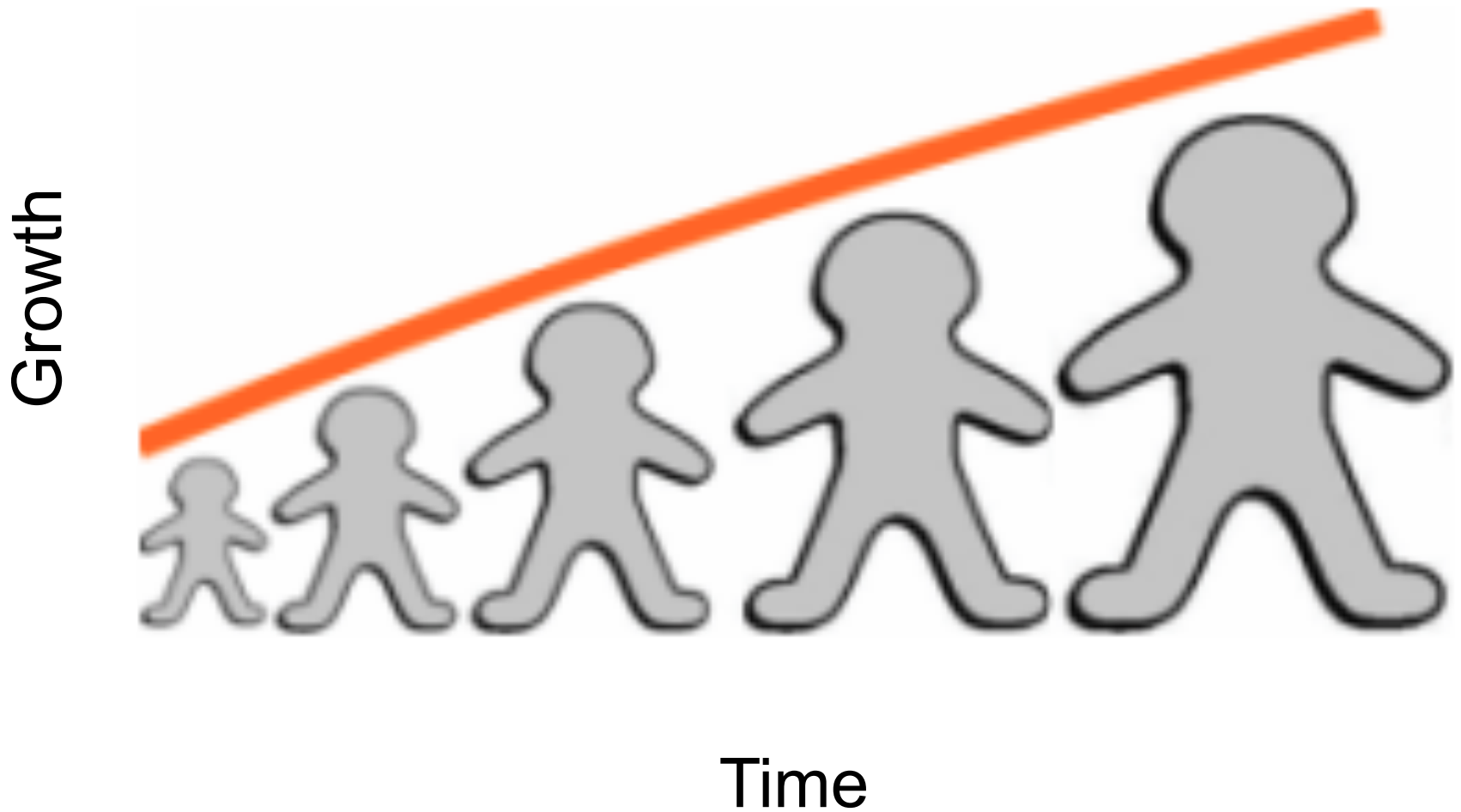
Comparison of Performance in Reading and Mathematics on the SAT9, 1999-00



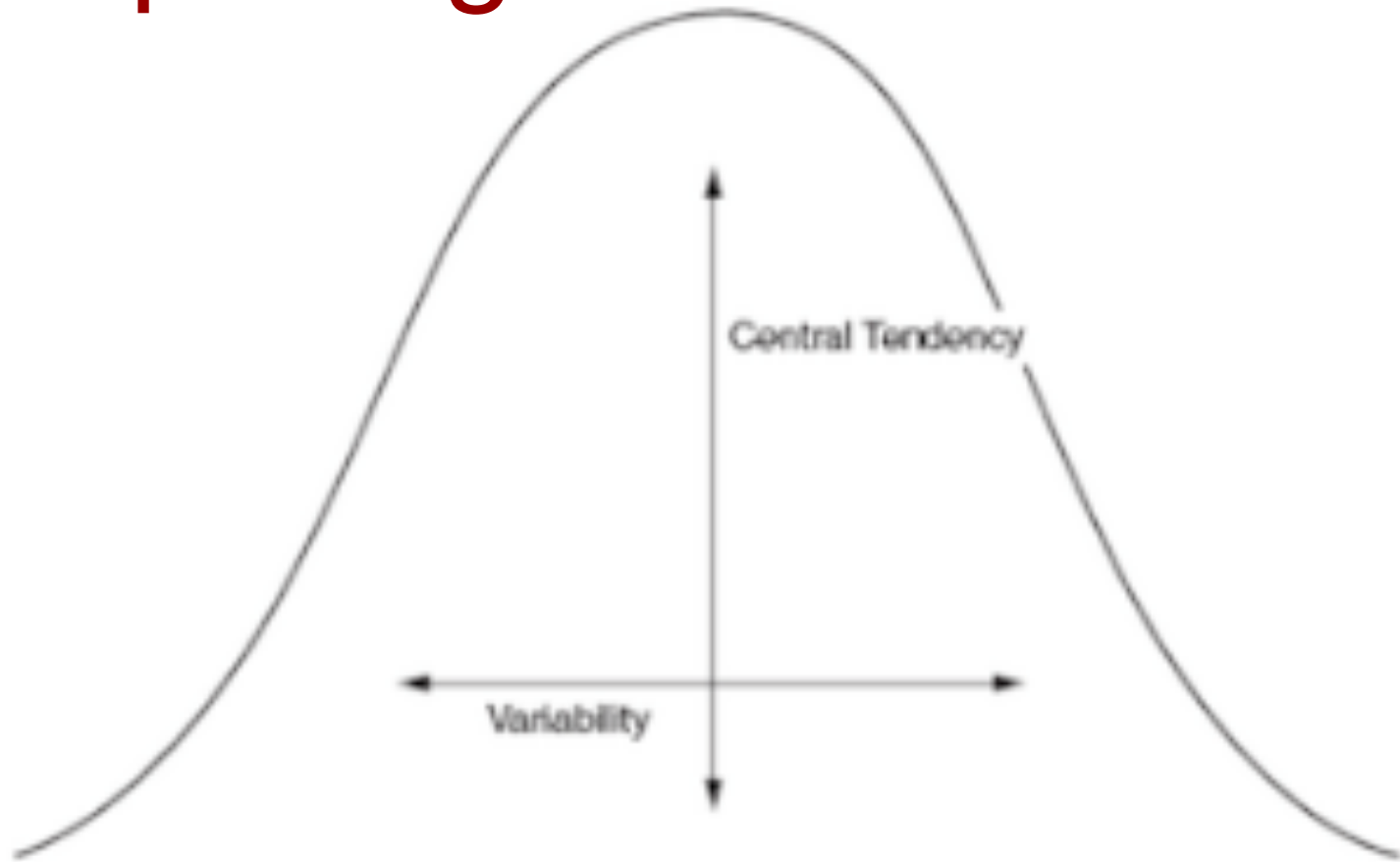


The National Medical Exam and Multistate Bar Exam are criterion-referenced tests - your score is compared to a set “bar”.

3. Self-Referenced Tests



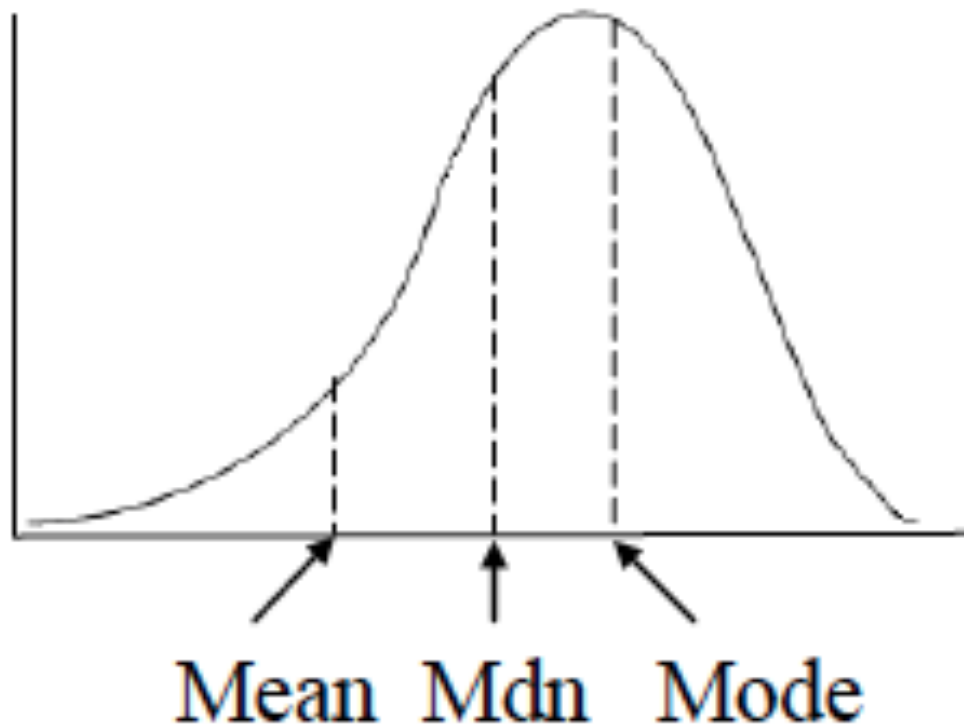
Interpreting Data



*Central tendency describes the central point in a data set.
Variability describes the spread of the data.*

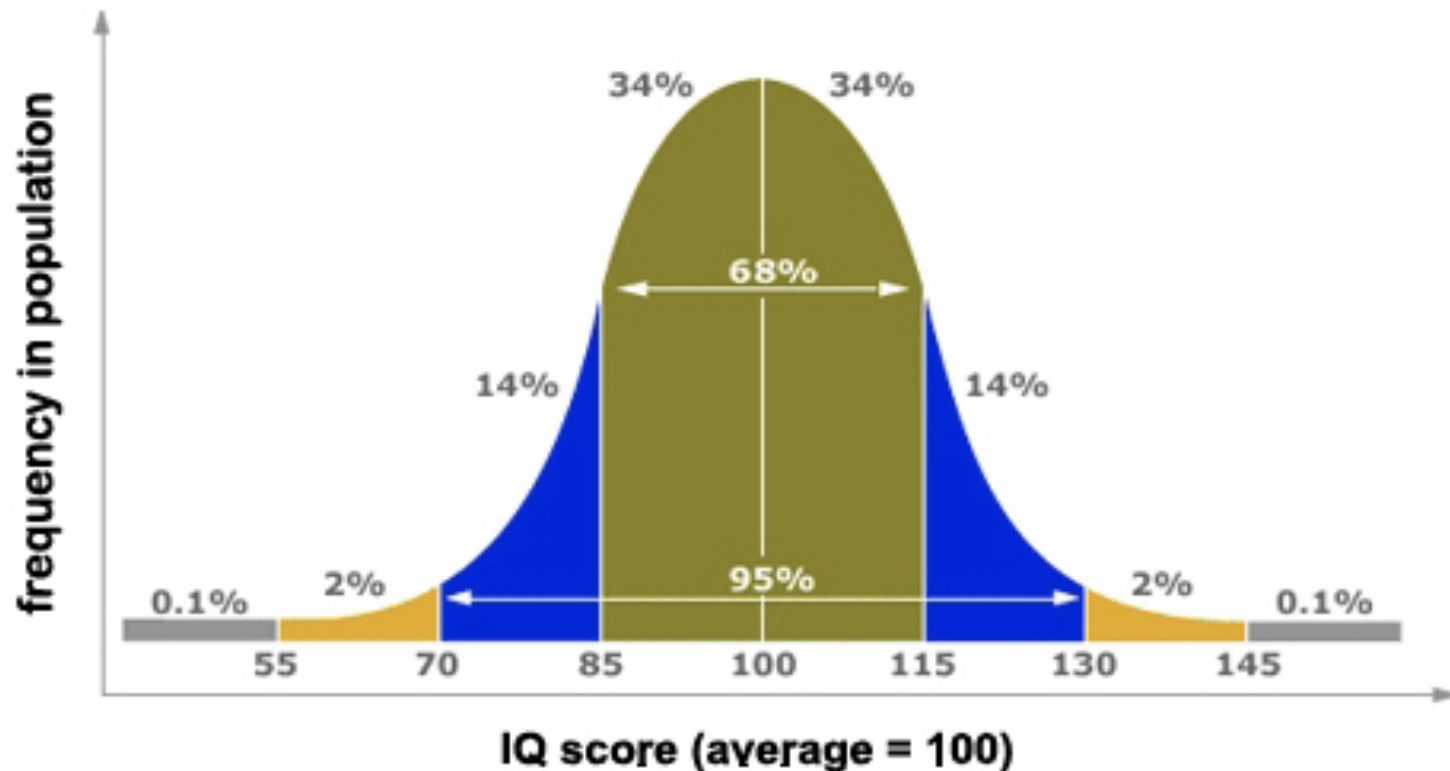
Central Tendency - measured by:

- Mean: average score
- Median: middle number
- Mode: most used number

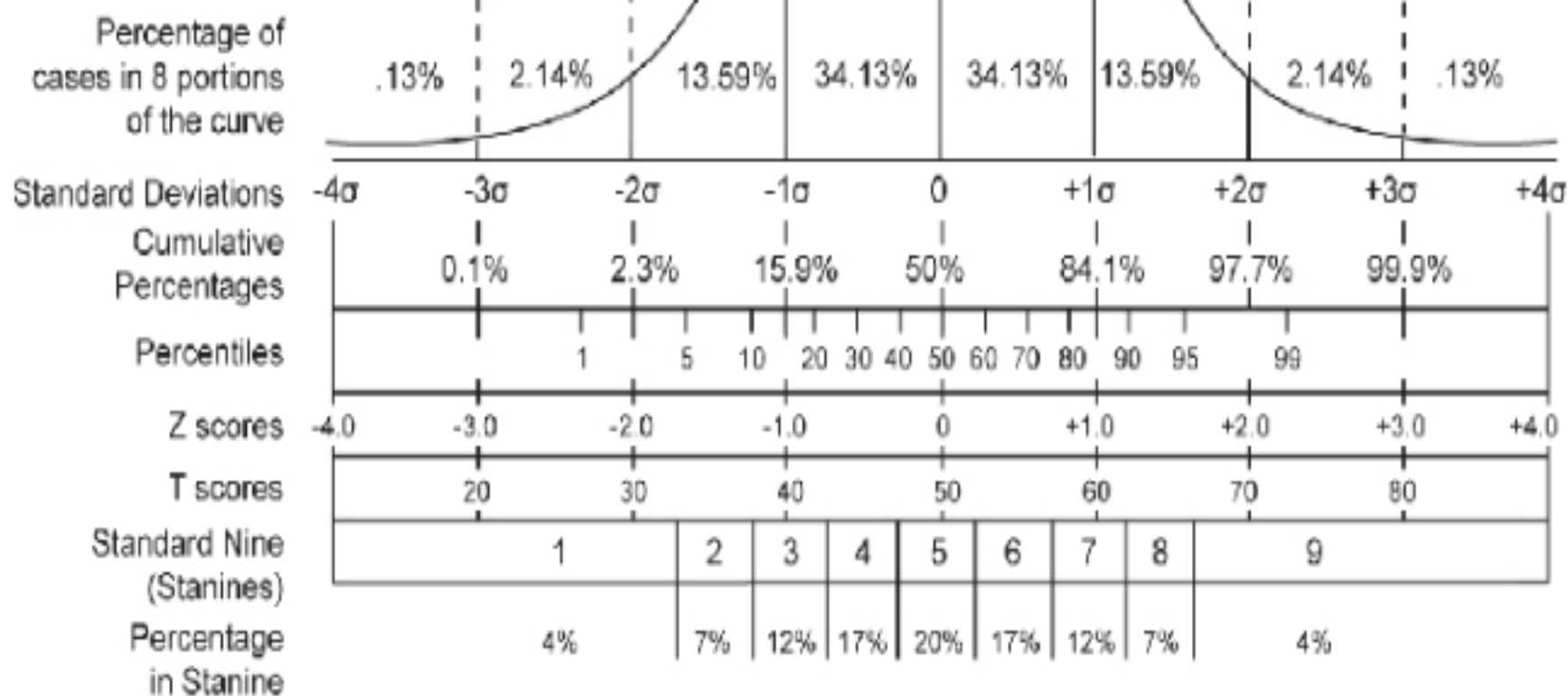


Dispersion - measured by:

- Variance: how far a set of numbers are spread out
- Standard deviation: how much variation from average
- Interquartile range: mid spread: middle fifty,



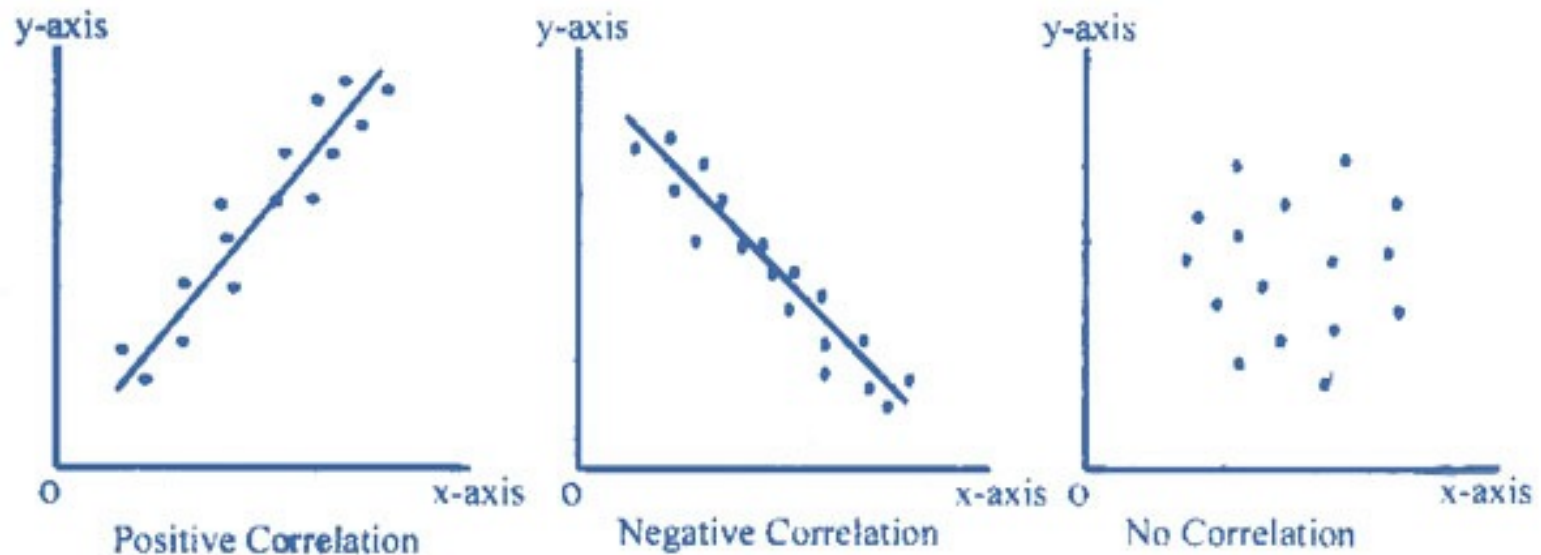
*Normal,
Bell-shaped Curve*



Correlations between Variables

Correlation - measure relationship

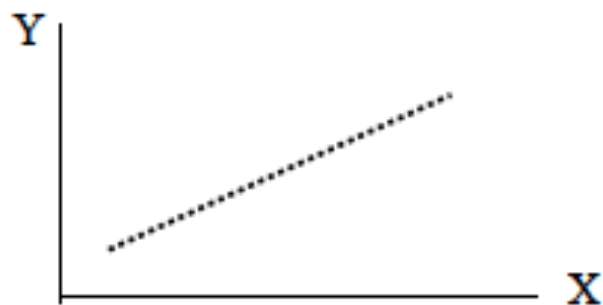
- Strength (0 to 1)
- Intensity (close or scattered)
- Direction (positive or negative)



.8 to 1.0	very strong
.6 to .8	strong
.4 to .6	moderate
.2 to .4	weak
.0 to .2	very weak

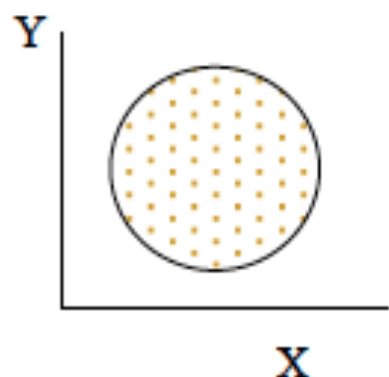
Correlation Coefficients

- range: $-1 \leq r \leq +1$
- $r = \pm 1$: perfect correlation
- $r = 0$: no association



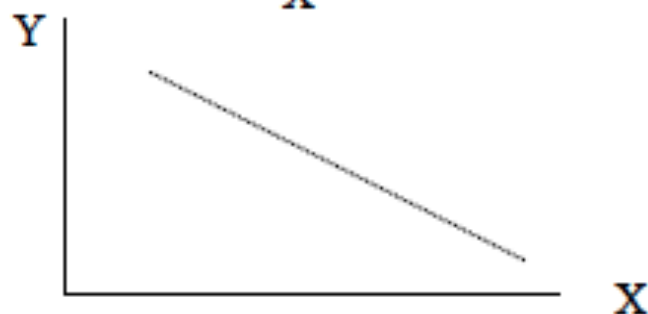
■ $r = +1$

All points fall on a straight line
up, from left to right
(slope > 0)



■ $r = 0$

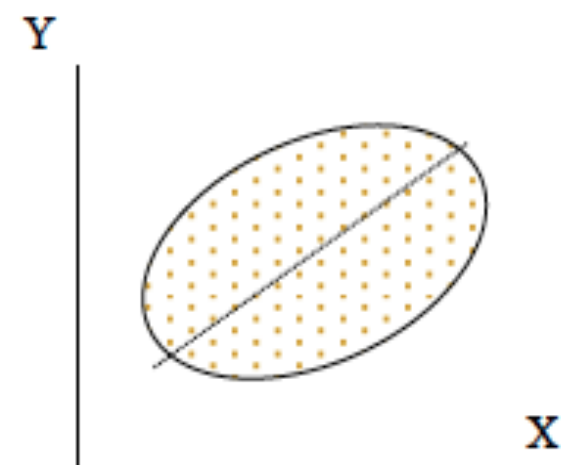
All points fall in a circle.



■ $r = -1$

All points fall on a straight line
down from left to right
(slope < 0)

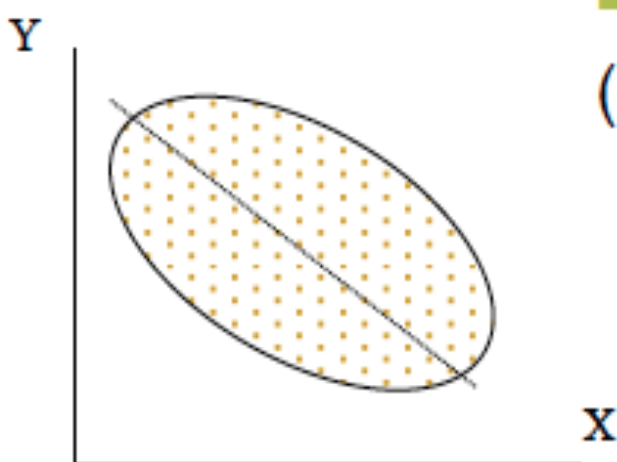
Correlation Coefficients (cont'd)



- $0 < r < +1$
(positive association)

All points fall in an oval, around a line up from left to right.

The **thinner** the oval, the closer the dots to the line, the closer the r is to 1.



- $-1 < r < 0$
(negative association)

All points fall in an oval, around a line down from left to right.

The **thinner** the oval, the closer the dots to the line, the closer the r is to -1.

.8 to 1.0	very strong
.6 to .8	strong
.4 to .6	moderate
.2 to .4	weak
.0 to .2	very weak

1. No Relationship

- shoe size to F&P reading level, gender to IQ, # pages in notebook to GPA

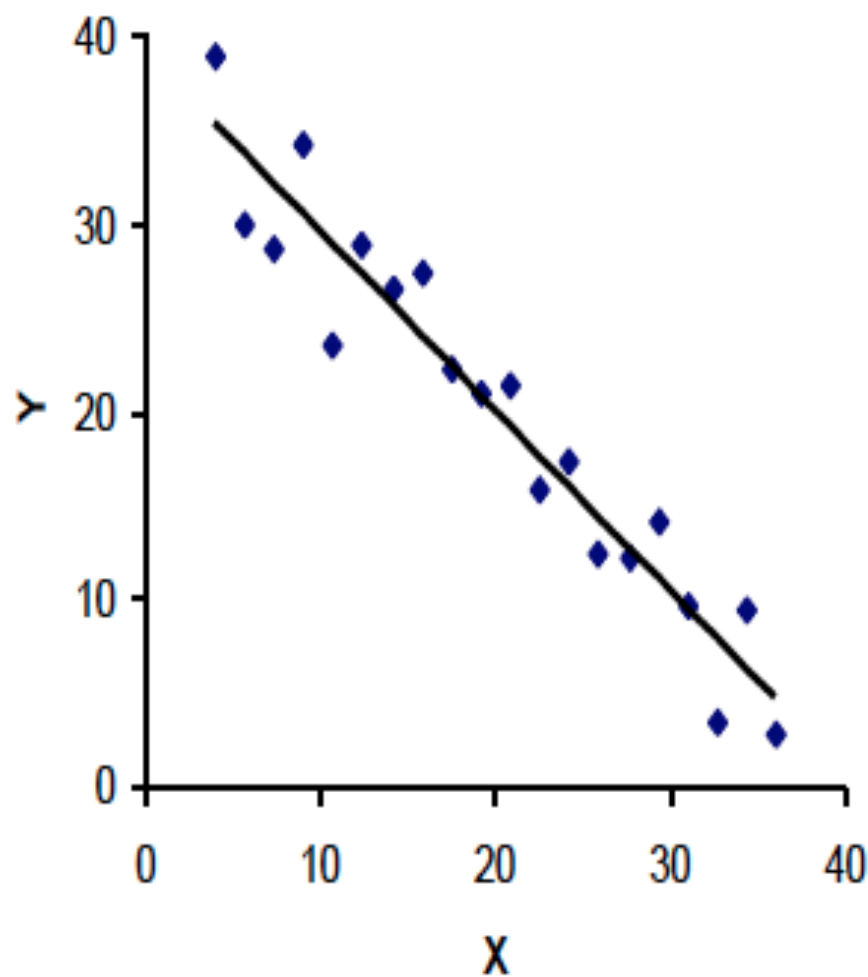
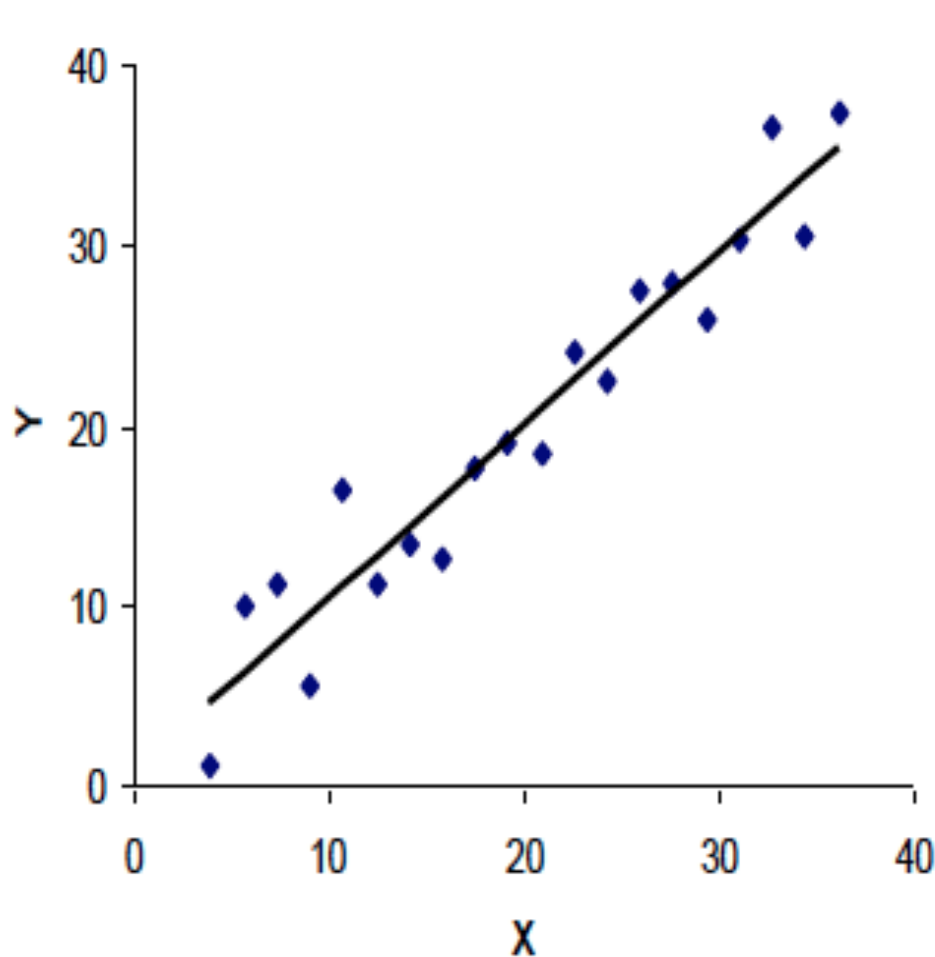
2. Positive Relationship

- Years of experience to salary, parent involvement to GPA

3. Negative Relationship

- Time spent practicing to time to complete test, truancy to achievement, hours spent mentoring at-risk to discipline referrals

Direction of Correlation?

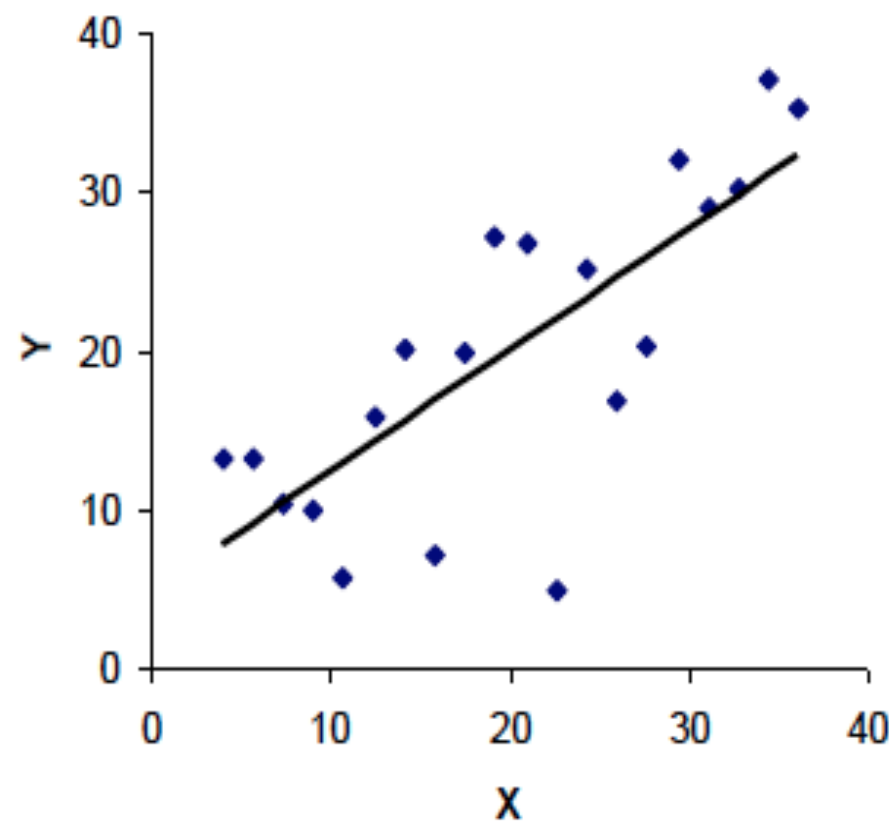
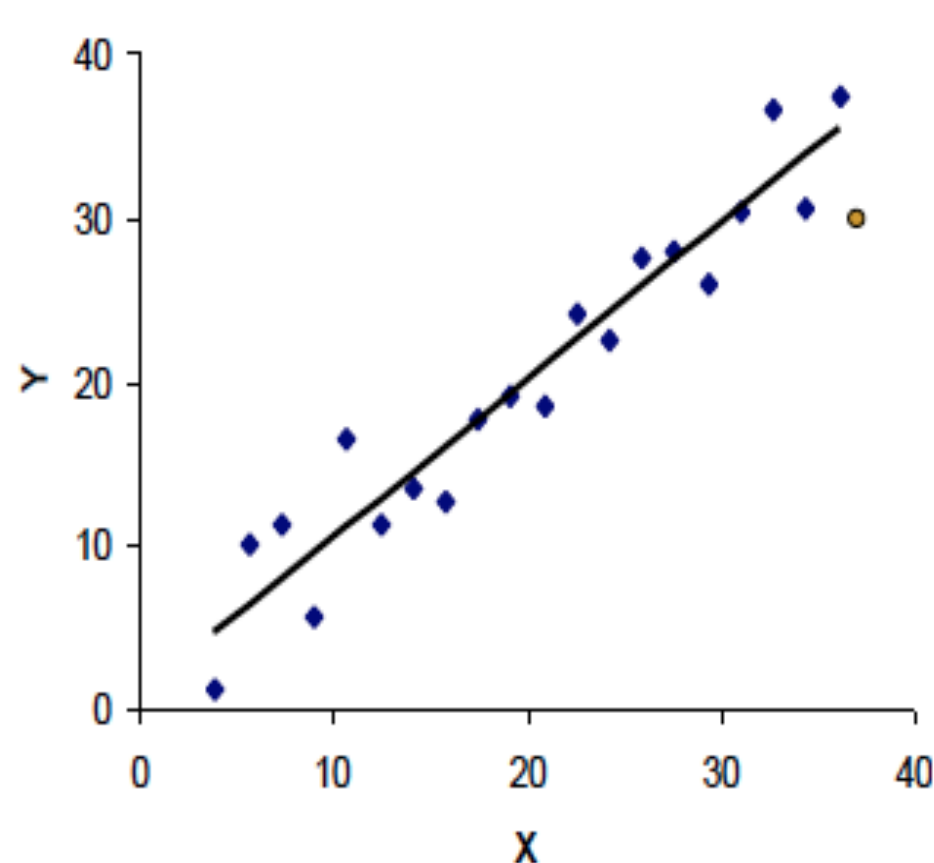


Can you **match the two correlations** with the two plots?

A. $r = -0.96$

B. $r = 0.96$

Strength of Correlation?



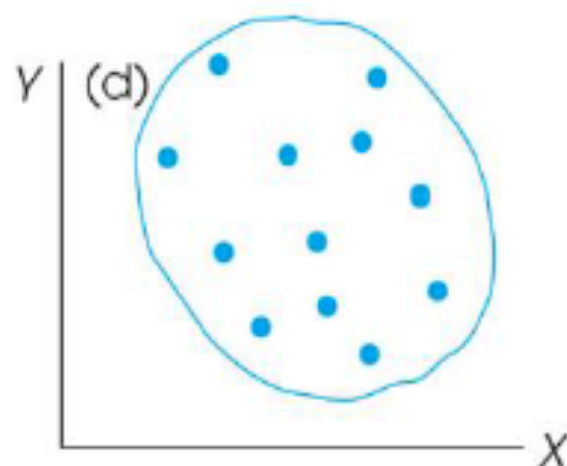
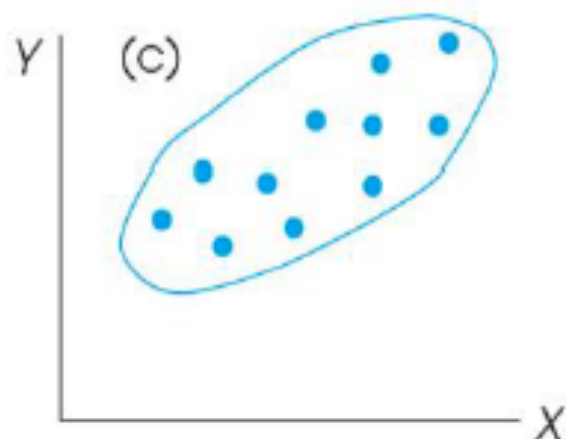
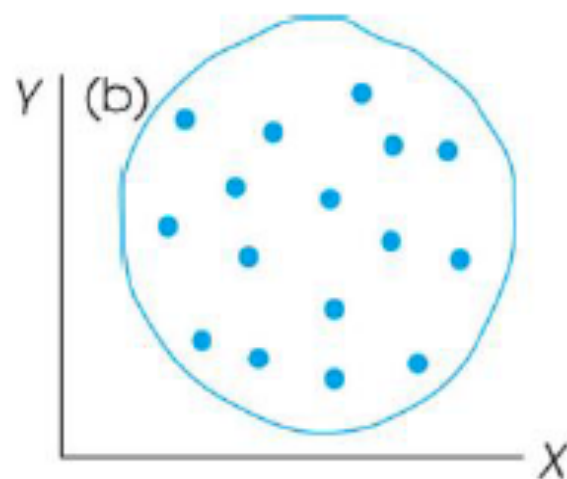
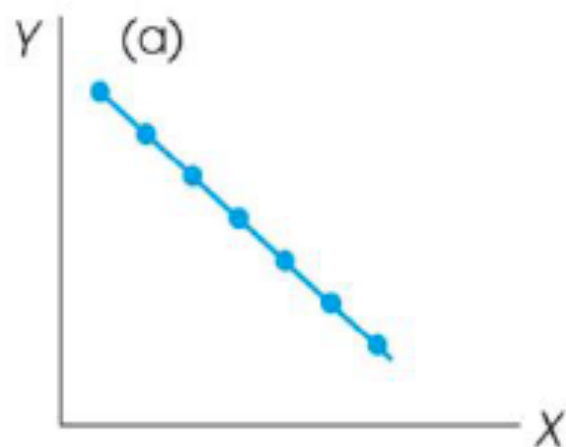
Can you **match the two correlations** with the two plots?

A. $r = 0.7672$

B. $r = 0.9591$

Different Linear Relationship Values:

--Guess the direction, strength, & approx. $r = ?$



Literacy Example from Keystones

Double Checking Data

- Screen for accuracy
- Develop the database structure
- Code the data

Reporting Data



A. Organizing the Research

Chapter 1: Introduction

- Statement of the problem
- Summary of the research
- Rationale for the research
- Research question
- Definition of terms

Chapter 2: Literature Review

- Background

Chapter 3: Methodology

- Population & sampling
- Reliability & validity

Chapter 4: Data Presentation

Chapter 5: Analysis of Data

- Answer to research question
- Significance of answer to the

field

B. APA Styl



"Must be the footnotes."

<https://owl.english.purdue.edu/owl/section/2/10/>